

# THE MENTAL LIMITATIONS OF THE EXPERT

E. H. HANKIN, M.A., Sc.D.



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BY

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Late Fellow of St. John's College, Honorary Fellow of  
the Allahabad University, Chemical Examiner  
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# **ON THE MENTAL LIMITATIONS OF THE EXPERT**

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**E. H. HANKIN, M.A., Sc.D.**

**Late Fellow of St. John's College, Cambridge, Honorary  
Fellow of the Allahabad University, Chemical  
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*“Ne supra crepidam sutor judicaret.”*

## PREFACE

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**T**HE greater part of this book is devoted to a comparison of the mental powers of the expert with those of the administrator and man of business.

The reader will find that the evidence, in great part, takes the form of anecdotes. In such a case both the reader and the author are handicapped ; the reader, because, if the story makes an appeal to his emotions, whether it appears amusing or surprising or merely tedious, by so much is its apparent value as evidence diminished : the author because he is tempted to lay undue weight on extreme and exceptional instances. But, if the reader will make due allowance for these facts, if he will bear in mind how often the study of the exceptional has led to explanations that the study of the commonplace had failed to yield, he, probably, will find that this book is something more than an attempt to prove that some of the author's friends lack common sense and that the rest of them are deficient in reason.

The expert is daily becoming more important in commerce and industry. Every day the need is becoming more urgent for the practical man to understand the expert and for the expert to understand the practical man. This book offers assistance to business men, lawyers and others, in understanding what the expert is, and to some experts, who apparently need to be informed, in understanding what they are not.

E. H. HANKIN.

*Agra, India, May, 1920.*

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# THE MENTAL LIMITATIONS OF THE EXPERT.

## CHAPTER I. INTRODUCTORY.

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Popular Opinions of the Expert—Reason the Main Mental Weapon of the  
Expert—Business Problems that can not be solved by Reason—the  
Business Instinct—Histories of Business men.

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THE term "expert" will be used in this book in the sense in which it is most commonly employed, namely, to designate a scientist who in virtue of his expert knowledge comes into contact with men of affairs of various kinds such as lawyers, administrators, or men of business. In this sense of the word the expert is a man who is characterised not only by his special knowledge but by his power of reasoning about it and his habit of adding to it. The term "specialist" it is advisable to restrict to a man who gets his living by using his own or somebody else's expert knowledge in doing some special thing.

Experts as a class stand somewhat apart from others; for their interests, their ways of thought, and even their amusements are apt to be different from those of ordinary people. To the general public the expert usually appears as a man whose motto is, "Take my money or my life, but for Heaven's sake don't amuse me," and who spends his life in finding out facts that other people do not want to know except on very rare occasions.

To the business man the expert usually appears as an unpractical crank. Common sense, according to the business man, is the sense by which money is made and it is a sense of which he finds no trace in the expert. In this opinion the business man is upheld by sometimes reading in the papers of some expert who, having made a valuable discovery, first patents it and then, by a deed of gift, hands over his patent either to the public or to some institution. His motive for this elaborate procedure is to prove his disinterestedness, which he does, regardless of the fact that he thereby "queers the pitch" of other experts who are now agitating for what they consider a fair day's wage for a fair day's work. "I thought he was only a scientist," said an aggrieved business man, when describing to me how an expert, by using his knowledge, had once got the better of him in some commercial matter.

The lawyer, who commonly regards as "experts" many who have no just claim to that title, knows of the expert as a man who, when in the witness box, is apt to make very positive statements that do not always bear the strain of cross-examination. To the lawyer the expert is merely a man who knows one thing better and other things less well than other people.

But a change is looming ahead. The importance of the expert for the progress and prosperity of our commerce is being rapidly recognised. His prospects are improving, and people are beginning to treat him with more respect than before. Indeed, one meets business men who lament the fact that at school they learnt chiefly such things as Latin and Greek and who consequently are now dependent on expert advice in all the schemes for the practical application of science that are going on around them. They are beginning to wish that they had learnt science at school and are resolving that their sons shall have a better start than they had in this respect.

If, therefore, practical men are beginning to wish their heads were full of expert knowledge, and if, as is the case,

experts are beginning to think they should have more to do with commercial and administrative affairs, it becomes a matter of importance to consider in what respect, if any, the mind of the expert differs from that of the practical man.

A study of this question may help us in deciding how far it is advisable to teach science to a boy who is not destined to become an expert. No one would deny that some knowledge of elementary science is likely to be of use to everybody. The problem is not whether science should be taught but how much, and at what stage in the child's development? Education is something more than an attempt to pour a quart measure into a pint pot, for the mind of the pupil is a pint pot that is not merely filled: it is a pint pot that becomes modified by the process of filling. The human mind is by far the most complicated mechanism of which we have any knowledge. The schoolmaster does not understand it. That is not his business. His business is to improve it. If we admit that he does improve it by methods which he has inherited from his predecessors, the question arises whether he would improve it still more, were he to desert these methods, and, sailing on uncharted seas, to make science with all its interests and wonders the main part of the education of the embryo man of business. If, after such an education, the business man started life with his head full of expert knowledge, the possibility must be admitted that he would have an expert bent of mind; and the question arises whether he would then be as good at his business as he is at present. *A priori* it is not impossible that the mental habits and acquirements of a man who spends his life in learning new facts would be widely different from those of the practical man with his frequent indifference to learning and his limited knowledge.

As an illustration of the different duties demanded from the brain of the practical man and that of the expert, let us consider the mental processes involved in discovering a new

aniline dye—the work of an expert, and in putting it on the market—the work of a man of business.

The conscious mental work of an expert carrying out a research of this nature consists almost entirely of observation guided by reason. The expert is pre-eminently a reasoning creature. Reason is the chief mental weapon that he has to use on all the problems that present themselves in the course of his research. His reason is aided by his memory, which is highly trained for its special purpose. Facts that he has apparently forgotten readily come back when needed in a reasoned line of argument. His efficiency as an expert depends to a very great extent on his power of calling to mind the data required for his reasoning processes.

But he does not depend entirely on reason. Sooner or later he meets with a difficulty in his work, that he is unable to solve by reasoning. He then has to wait for an original idea. An original idea, properly so called, is not a product of the conscious mind ; for it may come to him at the moment of waking, when he finds the idea present in his mind having come there without any conscious effort on his part. Or original ideas may come to him while he is thinking. They occur instantaneously, as difficulties arise, and occur so rapidly, that there is no time for them to have resulted from a conscious reasoning process. But such ideas are always subordinated to reason. They are never accepted by the expert till they have been tested. Indeed, these ideas are usually nothing more than suggestions for new experiments.

The progress of the young expert is one of trial and error. As a rule he only goes right after testing every way, or at least a large number of ways, of going wrong. But, as he gains experience, he may learn to recognise instinctively which of several courses is the best to choose or which is the best method of testing to employ. But any such power of instinct or intuition depending on an activity of the subconscious mind

is rarely well developed among persons of the expert type of mind. With the expert, reason is the most important mental weapon. Intuition plays a subordinate, though in some cases a very useful part. "Genius," said Edison, "is 1 per cent inspiration and 99 per cent perspiration."

Supposing that by the application of such mental methods the new dye has been discovered, the next question to solve is whether it can be made commercially. In solving this question reason still reigns supreme. By reason an estimate has to be made as to the availability of raw materials, the cost of manufacture, and the possibilities of using bye-products that may be formed in the process. A wider view of the matter has to be taken than was necessary in discovering the dye. New factors have to be considered, but still the mental process involved is mainly one of reason.

Now suppose that it has been discovered how to make the dye on a large scale at a suitable price, and suppose the matter comes into the hands of a business man. As an example let us imagine that the problem that presents itself is whether it would pay to dissolve the dye in water, put it into bottles, and sell it as ink. In the first place the business man has to make an estimate of the cost of bottling and packing and labelling, problems that can be solved by the application of reason. But he very soon comes to problems that can not be solved in this way in the time and with the data available. He has to consider what credit to give, what contracts to enter into, whom to appoint, what buildings to rent, and what money to spend on advertisements. He must also consider what other inks are in the market, what will be the effects of competition, whether his rivals will cut their prices, and so on. If such problems had to be treated by reason, his progress would be slow and laborious. Vast amounts of data and highly involved arguments would be required. Anyone who knows business men will admit grounds for doubting whether they are

capable of highly involved arguments. Usually the business man shows an instinctive dislike for a reasoned argument. For his special problems, that apparently need more reason and more data than those treated of by the expert, he brings into play less reason and fewer data. Instead of taking more time to settle complicated questions he takes less time than does the expert in settling far simpler affairs. In short, when faced with business problems, the reason of the business man goes into the background and is replaced by a mental activity commonly termed the "business instinct."

An attempt will be made in this book to show that the business instinct is not a careless and imperfect form of reasoning helped out by guesses, but that it is a particular case of subconscious mental activity, an activity in which knowledge and experience play no such part as do knowledge and experience in the mental processes of the expert. Before going on to consider the nature of this subconscious mental activity it will be advisable to describe in some detail the mental capacities of the typical man of business.

Men of business of my acquaintance, have, with scarcely an exception, been completely free from any intellectual interest. An inspector of schools, who in the course of his duties had to meet many of the leading manufacturers of certain counties in England, told me he found these men to be, without exception, singularly ignorant people.

It might be asserted that a business man, if he has no knowledge of books, at least knows and minds his own business. But an acquaintance with business men will easily and certainly show that their knowledge stands in no such proportion to their capacity as does that of the expert. A business man will readily take up a subject of which he is almost wholly ignorant and he makes no attempt first to read it up in books. He relies, not on book-learning and reason, but on the business instinct. Let me quote some examples of what I mean.

A business man gave me the following account of his career. His father was creditor of a cotton-spinning mill that went bankrupt. He persuaded his father to take over the mill and put him in as manager. He knew nothing whatever at the time about cotton. He had never managed a factory of any kind. But he began on this cotton mill and in a short time made it a success. Afterwards he started a flour mill at a time when he knew nothing about flour and then an ice factory when equally ignorant of ice. He now owns a large number of factories. His success is partly due to his plan of paying well for skilled men to supervise the different departments. He himself is quite innocent of either technical skill or expert knowledge. He has forgotten all that he learnt at school. He had taken prizes for mathematics. But now he cannot remember the title of a single proposition of Euclid. To my surprise I found that he could not define parallel straight lines. He said that parallel lines were lines that were parallel. He could not even attempt the kind of mental exertion required to think of a definition. So little capable is he of logical presentment that he was quite unable to explain to me the difference between the deferred shares and the ordinary shares in a particular company. All he could tell me was that this was something that had been settled before the company was formed. But when I asked him what he thought of these shares as an investment he at once gave definite opinions. The ordinary shares would in the next three months rise from 95 to 300 and the deferred shares from about 120 to 1000. He could give no satisfactory logical reasons for his belief but, as the event proved, his business instinct had led him to make a remarkably accurate forecast in each case.

An American business man once told me his history. He had had an indifferent school education and at an early age had had to shift for himself. He became a clerk on a railway. He found some additional employment for his spare hours and



contrived to save money. After a time he threw up his job and moved to a town somewhere in California. He came there without any invitation or offer of employment. He merely trusted to his natural wit to be able to take advantage of anything that turned up. He took up his quarters in a boarding house. On the day of his arrival it happened that there were stewed onions for dinner. He asked their price and where they came from. The next day he happened to see a number of boxes of onions outside a shop. "How much are they," he asked. "Ten cents a bushel," said the shopman. "Then," said he, "I'll buy the lot." Afterwards, as he assured me, he discovered that this was the only stock of onions in the place. "What did you know about onions?" I asked him. "Nothing" he replied. "What did you know about trade?" I demanded, and received the same reply. He went on with his story. The price of onions went up. He purchased the next available supply from a neighbouring town whence they had to come by ship. He still kept up the price until he received information that more onions were arriving by another route when he at once disposed of all he had left at a good profit. The whole of his life history seemed to have been made up of similar incidents. Lack of knowledge that would have checkmated an expert was of no importance to him. He was always ready to turn to a thing about which he knew practically nothing, provided his business instinct told him there was a chance of coining money. He was quite interesting to talk to, though totally ignorant of anything that he had not dealt with in the way of business. I happened to tell him that I was at the time studying the bones of certain fossil reptiles. He thought they had been discovered among the antiquities of ancient Egypt.

The decisions of the business man are often arrived at far more rapidly than would be the case if they were due to reason. It takes an appreciable time to reason out a proposition of Euclid. A business man decides on the spur of the



moment matters far more complicated than anything treated of by Euclid. In the business instinct we are dealing with a more recondite power of the human mind than conscious reason. This power of deciding rapidly in business matters is analogous to the mental activity of a doctor who makes a rapid diagnosis but who is unable, at the time, to give his reasons for his opinion. In each case we are dealing with an activity of the subconscious mind. This activity may be reasoning by the subconscious mind; but if it is, it is, as will be shown below, a reasoning process that is far more rapid than that which occurs in the realm of consciousness.

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## CHAPTER II.

### SUBCONSCIOUS JUDGEMENT.

*Business Instinct—Subconscious Diagnosis by Doctors—Power of Rapidly Judging Capacities or Character—Refusing Credit on Instinctive Feeling—Minute Sensory Impressions Affecting the Subconscious Mind only—Use of Such Impressions—Illustrations.*

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HOWEVER commonplace it may appear to say that a business man depends on his business instinct it is a very remarkable fact. For we commonly imagine that reason is the highest power of the human mind. The main object of education is to develop reason, partly by using it and partly by developing the memory. But when a boy grows up to be a man of business he finds that reason is an inferior weapon. He constantly has to solve problems that are beyond the scope of reason, and this he does by the use of his business instinct.

We say that the business instinct is due to an activity of the subconscious mind because the man who has it is unconscious of the nature of the mental process by which he arrives at his decisions. We have now to consider other examples of subconscious judgement and see how far they resemble the business instinct.

The first case to be described is the power of rapid diagnosis possessed by many medical men. It very frequently happens that doctors distinguished for their power of rapid and accurate diagnosis are unable to give reasons for the opinions they form. For instance, a medical man gave me a detailed account of a doctor, at a hospital where my informant had been a student, who had a power of this kind that was little short of marvellous. A child arrived one day at the hospital very ill. Several members of the staff examined the child carefully, but were quite unable to discover what was the matter with it. Afterwards, not knowing of this failure in diagnosis, the doctor

in question came to the hospital. He happened to walk through the ward where the child was lying. While walking slowly past the child's bed, but without stopping, he remarked, "That child has pus in his abdomen." This rapid diagnosis was afterwards found to be correct. It is easy to say that this was a lucky guess. But the doctor in question so frequently made lucky guesses of this nature that it is impossible to ascribe them to chance. My informant, who is now at the head of a large hospital, has a similar power. He tells me he is sometimes unable to tell the students the reasons for his diagnosis, despite his attempt to call his reasons to mind. I have heard of another physician whose habit of intuitive diagnosis went so far that he was useless as a teacher. Often and often when asked why he had made a particular diagnosis he had to reply "I am sure I don't know." This power of diagnosis without conscious reasoning seems to be by no means uncommon. Every doctor asked has been able to quote me instances, which are generally found amongst the members of the staffs of large hospitals, who include, I believe, the picked men of the profession.

In these cases, as in others about to be described, the act of forgetting is a prelude to the activity of the subconscious mind. If all the facts involved were still present to his consciousness, the doctor would inevitably use his reason. The facts are partly at least forgotten and a subconscious diagnosis is made far more rapidly than a decision based on reasoning about remembered facts.

Another example of subconscious judgement is offered by the power that many people possess of rapidly judging character or capacity. The success of eminent business men, in some cases, appears to depend greatly on their power of rapidly choosing the right man for a particular purpose. After an acquaintance with a man, far too short to admit of any reasoned opinion, their subconscious judgements give them a verdict as to

his capacity that is rarely, if ever, wrong, if the evidence known to me may be believed. How they form their opinions is always unknown to them. One business man is said to watch the movements of the mouth of a candidate for a post. Another listens to the voice and carefully avoids looking the candidate in the face. More often the possessor of this power is quite unaware what feature or character particularly impresses him.

A business man of my acquaintance, to whom I will refer as Mr. X, has this power in a remarkable degree, and finds it of the greatest use to him in his work. He sometimes merely recognises that it would be safer not to do business with a particular man. But sometimes, on the very shortest acquaintance, he feels a strong unreasoning repugnance to a particular individual. He has a feeling of being paralysed with horror. For instance, once he was staying in a small village in England. He went to church and took a dislike of this nature to the clergyman the moment he appeared and before he had opened his mouth. Afterwards the clergyman wanted to be introduced to my informant who scandalised his friends by flatly refusing. Some two years afterwards it transpired that the clergyman was a thorough scamp who had defrauded three orphans, to whom he was guardian, but he had done it so cleverly that he just managed to keep outside the law. Once, when travelling in eastern countries, an acquaintance wished to introduce Mr. X to a member of a group of religious mystics. Mr. X having seen this man promptly refused. Shortly afterwards, in a scandalous police court case, it was shown that the man in question was as unfit as was the late Mr. Squeers for his post as an instructor of youth.

On questioning Mr. X as to the development of this power, very little was found out. He says that, as a child, as often happens with children, he had a habit of taking unreasoning likes and dislikes to people on trivial grounds. At the age

of 17 he went into business. His occupation brought him into contact with fresh people almost every day. He was of a shy disposition and used to listen while others were talking. Occasionally he would feel that a man was peculiar, but without being able to decide in what his peculiarity consisted. He would consciously recognise that this vague peculiarity that he had seen in one man was present in another. He told me he would compare them, but what he compared appears to have been the effect the peculiarities produced on him in any two instances. At length he acquired the power of recognising bad characters and people of bad temper. This was all that was necessary to him in his business. He had merely to decide whether to trade with any one. He had no need to judge capacity for particular posts and apparently had no particular power of doing so. He could recognise a man as being a bad character without hearing his voice and even from a photograph. He can recognise bad character in an Indian but less easily than in an Englishman. He finds it very difficult to form an opinion of a Chinaman. He made one statement that was very difficult to believe, namely, that a person's reflection in a looking glass was better than a direct view for forming an opinion as to his character. Mr. X asserts he has never made mistakes so long as he has trusted to his first intuitions. (1) (Figures in brackets refer to illustrative cases at the end of the chapter.)

The power of judging character is sometimes strongly developed in women, but no evidence is known to me for or against the popular belief that they are endowed with this power more often than men. It is possible that fortune-tellers, so far as what they say is not merely quackery, depend upon subconscious recognition of the characters of their clients. A lady fortune-teller told me she depended on intuition and that she used palmistry merely as a means of humbugging her dupes. (2).

Similar to the power of judging character is the power that some business men possess of subconsciously estimating the solvency or reliability of people who come to them demanding credit. A business man of my acquaintance, who boasts that he has never made a bad debt, has told me of instances in which he has refused credit owing to an intuitive feeling. In one such instance his friends were angry with him for refusing what appeared to be good business, but which later events proved would have been very bad business indeed. In such cases there is no doubt whatever that the premonition or intuition is derived from the subconscious mind, for it stands in contradiction to the dictates of reason. The applicant for credit perhaps brings with him unexceptional evidence of his solvency. He makes thereby an appeal to reason. Though reason may tell the business man that it is safe to give the credit demanded, it sometimes happens that he has an intuition to the contrary. What is to be done? In a book called "*The Making of a Merchant*," by H. N. Higinbotham, this eventuality is discussed. (p. 153.) The author says that the first time the young merchant "confronts a condition of this kind he may well pause and ask which is the safer guide to follow, intuition or reason. Speaking from individual experience I would say, act upon the intuition, for if the case were analysed thoroughly it would be found that the intuition is but the impression gained from a kind of subconscious reasoning." Here we have a definite statement as to the superiority of subconscious judgement to conscious reason in estimating a man's solvency. Mr. Higinbotham goes on to give examples which it is needless for me to quote. Incidentally, it may be noted that the above statement is an example of business ability not being connected with any very high development of reasoning power; for the author gives a theoretical explanation of his experience, and mistakes it for a proof of the correctness of his opinion.

In each of the above categories apparently we have to deal with a mental process analogous to recognition. On receiving certain sensory impressions the subconscious mind recognises a particular disease or a defect of character or of business ability.

It may be asserted that it is very remarkable that the same sensory impressions should produce different effects on the conscious and on the subconscious parts of the mind. But this assertion is unjustified; for there are reasons for believing that the eye, for example, sends to the subconscious mind far more elaborate and detailed impressions than it sends to the conscious mind. The following evidence bears on this point.

In treating of different qualities of wheat, Professor Biffen says:—"An experienced buyer can grade wheats with fair accuracy by inspection only, but the grading appears to be dependent on an unconscious recognition of the varieties in question and a previous knowledge of their milling and baking properties." \* It appears from this statement that different specimens of wheat may have physical differences too small to be consciously noticeable but yet that the eye or the sense of touch may convey knowledge of these differences to the subconscious mind, and that this knowledge is used by it in an act of subconscious recognition.

Some years ago when studying the flight of soaring birds, by practice my eye became trained to see minute differences in wing adjustments that would be quite invisible to the untrained observer. About one adjustment that was used for checking speed I wrote in my book that I learnt to recognise when a bird began to use it, although there was no change in the appearance of the bird sufficient for me to express in words.† Afterwards the nature of the adjustment was discovered. It

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\* "Systematised Plant-breeding" in *"Science and the Nation"* (1st Ed. 1917, Cambridge University Press, page 168).

† *"Animal Flight"* (Iliffe and Sons, London, 1913), p. 126.

produced a change in the outline of the wing-tip that was too small to be recognised by me consciously, but my subconscious mind apparently was aware of the difference and enabled me to know that the bird had changed its mode of flight.

There are other reasons for thinking that the usual term "training one's eye" is inaccurate. The difference between the trained and the untrained observer does not lie in the eye or the optic nerve. The optic nerve carries the same set of impressions in each case. With the untrained observer only a few of these impressions come through to consciousness. With the trained observer a larger proportion of the impressions affect the consciousness.\*

These facts do not lead us any nearer to a real explanation of subconscious recognition. It may be that more impressions from the eye are available to the subconscious mind of a doctor, for example, who makes an almost instantaneous diagnosis for which he is unable to give his reasons, than are available to the conscious mind of another doctor who makes his diagnosis after a slow and elaborate application of reason. But if more sensory impressions are available in one case than in the other, how is it that less time is required to deal with them? It is in the rapidity of action of the subconscious mind, in the way in which it appears to deliberate on all the data at once, or nearly at once, that we find a mystery that as yet defies explanation.

Instances of abnormal acuity of the senses of hearing and sight in hypnotised persons are well known, and furnish further evidence that more minute sense impressions reach the brain than those that are usually presented to our consciousness.

From the point of view of further research the power of subconscious diagnosis possessed by doctors is more important than the power of estimating capacity possessed by business

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\* See a note "On Observation of Transiently Visible Movements" in the *Aeronautical Journal*. July—September, 1915, page 104.



men. From their training doctors are more likely than business men to appreciate a scientific problem and to reply to questions in a way that would satisfy a scientist. Further, their diagnoses are subject to criticism and control by what happens to the patient. But if a business man refuses credit there is commonly no means of judging afterwards whether or not he was acting wisely. The evidence brought forward in this chapter of the capacity for subconscious recognition in business men is, therefore, by no means so conclusive as is the evidence relating to the subconscious mental activity of doctors. A business man once described to me how he had been appointed as manager of a jute mill as the result of a five minutes' interview in which no questions had been asked as to his capacity and no testimonials were shown or demanded. My informant made the mill a success. But previously the mill had worked at a loss, and one may well ask whether the previous manager, who was a failure, had also been appointed as a result of an equally casual interview.

The facts recorded in this chapter indicate that the subconscious mind may be trained to exercise a power of recognition, or a power analogous to recognition, that is far higher than the power of recognition possessed by the conscious mind. In some of the instances quoted—such as grading wheat or my own experiences on the flight of birds—there can be little doubt that the subconscious mind receives and uses sensory impressions too small to affect consciousness. In other instances, such as diagnosis of disease or character, probably the subconscious mind uses sense impressions of this kind; but there is room for suspecting that the mental process that occurs is something far more complicated than is involved in recognising that a rose is red. One suspects that there is a balancing of evidence in the subconscious mind before the diagnosis is made. In the next chapter examples of the activity of the subconscious mind will be described in which there is yet more

reason for suspecting that the decision is arrived at after balancing evidence and after a process of choice.

#### NOTES

(1) As an illustration of subconscious judgement in estimating character the following incident may be quoted. A medical officer at a certain military hospital in India was impressed by the ability and industry of a subordinate. He thought that this subordinate had not got on as well as he deserved, and hence went out of his way to help him and recommended him for promotion. This medical officer was at length transferred. His successor on the very first occasion that he met the subordinate in question came to the conclusion that he was a scoundrel of the first water. This rapid act of subconscious judgement turned out to be correct, as within a week the subordinate was arrested for the murder of his wife. He was found guilty of this crime and also of the murder, under atrocious circumstances, of a friend with whose wife he had criminal relations. The case, which was known as the "Clark Murder Case," attracted considerable attention at the time.

(2) Lady Cardigan in her autobiography relates how, as a girl, she visited a woman who had a great reputation as a fortune-teller. This woman began by telling her that she would not get married for a long time and that when she did marry she would marry a widower. The woman then went on to foretell various commonplace events that might happen to anybody. The prophecy that she would marry a widower was by no means commonplace. I suppose only a very small percentage of unmarried girls have proposals made to them by widowers. But, as the event proved, the fortune-teller had greatly understated what was to happen. Lady Cardigan says in her singularly frank account :—

"Strangely enough the prediction came true, for Lord

Cardigan was a widower, and nearly all the men who proposed to me were widowers. I was asked in marriage by Lord Sherborne, a widower with ten children, by the Duke of Leeds, who was a widower with eleven children, and by Christopher Maunsell Talbot, once Father of the House of Commons, also a widower with four children. Prince Soltykoff, the Duke of St. Albans, Harry Howard, and Disraeli, were other widowers who proposed to me, so I suppose I must have had some unaccountable fascination for bereaved husbands."\*

Whether or not the fortune-teller had had experience that girls who marry later rather than sooner are more attractive to men of mature experience and age, and recognised that the future Lady Cardigan was of a disposition to hesitate before entering the marriage state, it is a fact that different classes of women are attractive to different classes of men. It would not be very wonderful if the fortune-teller had subconsciously recognised to what class Lady Cardigan belonged, and so was able to some small extent to predict her future.

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\* "*My Recollections*," by the Countess of Cardigan (George Bell and Sons, London, 1909), p. 38.

## CHAPTER III.

### EXAMPLES OF SUBCONSCIOUS JUDGEMENT.

Instinctive Powers of Statesmen and Administrators—The Jury System an Example of Use of Subconscious Judgement—Recently Acquired Knowledge Bad for Judgement—Value of Forgetting—Comparison of Committees and Juries—Lord Mansfield's Advice never to give Reasons—Cross-Examination—Rapid Composition by Journalists—Tackling a Problem by Reason or Intuitively—Story of Babbage—Methods of Sherlock Holmes in Practice.

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WE will now consider other examples of subconscious judgement that appear to be of a higher order of complexity than those hitherto discussed. Their nature is such as to suggest that processes analogous to choice and reason may go on in the subconscious mind of a higher degree of mental efficiency than occur in the region of consciousness.

An important instance is the instinctive power of rapid decision possessed by statesmen and administrators. Of Lord Kitchener it is recorded that "he had a most extraordinary instinct in military matters. He never thought things out. He seemed to know them." (1) Here the power of rapid decision was not due to the use of reason but to its replacement by the work of the subconscious mind. As an example of the prevalent belief that instinct is more important than reason to a statesman the following opinion expressed by Mr. F. S. Oliver may be quoted :—

"Looked at from the strictly intellectual standpoint, the reasons which satisfied German statesmen with regard to Britain's neutrality were overwhelming, and might well have convinced others, of a similar outlook and training, who had no personal interest whatsoever in coming to one conclusion rather than another.

None the less the judgement of the Kaiser and his Ministers was not only bad, but inexcusably bad. We

expect more from statesmen than that they should arrive at logical conclusions. Logic in such cases is nothing ; all that matters is to be right; but unless instinct rules and reason serves, right judgement will rarely be arrived at in such matters as these. If a man cannot feel as well as reason, if he cannot gauge the forces which are at work among the nations by some kind of second sight, he has no title to set up his bills as a statesman." \*

Everyone who has had experience of administrative officials is aware that they do as a fact often arrive at decisions with great rapidity. An expert when dealing with an affair of test-tubes may take weeks or months before he is satisfied that his data are sufficient for a reasoned decision. Our fellowmen are far more complicated than test-tubes. Nevertheless administrators and business men often decide about them with great rapidity and in the absence of sufficient data for the use of pure reason. If reason was the only mental weapon of the administrator he would require far more time for a decision than does the expert when dealing with test-tubes. But as a matter of fact his decisions are often extremely rapid. The statesman, the politician, and the administrative official, would be hard put to it if they had to tackle every problem that comes before them by the scientific methods of Sherlock Holmes. The interest that the character of Sherlock Holmes arouses is in great part due to the fact that in real life it so rarely happens that we are able to rely on reason alone for any but the most straight forward problems. When, in fiction, we read of this happening, the singularity of the occurrence at once fixes our attention and our curiosity. (2)

An illustration of the power of subconscious judgement possessed by ordinary people is to be found in the success of the jury system.

A jury consists of men probably ignorant of law, pro-

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\* "*Ordeal by Battle*," p. 68.

bably unaccustomed to hearing and interpreting evidence, and probably lacking the mental agility of barristers in appreciating a new subject ; yet there is a consensus of opinion among legal authorities that in judging of matters of fact they often give better verdicts than the judges themselves. (3)

It may be thought that a jury having listened to the reasoned arguments of counsel and the reasoned summing up of the judge, and having heard the evidence of witnesses on which the reasoning in the case is based, must necessarily use their reason in coming to a verdict.

I should be unable to counter this view were it not for my own experience on a jury. On the first occasion I listened carefully to the whole of the evidence. At first I remembered it, but it was soon obvious that my recollections were being driven out of my consciousness by the effect of their quantity. There were speeches for the prosecution, speeches for the defence, evidence on one side and the other, cross-examinations and then, after the partial speeches of the counsel, the very impartial summing up of the judge. It is a usual experience that if one tries to remember too much at once one forgets everything. If one hears a joke or a good story one may remember it, but if one hears twenty jokes or twenty good stories at a sitting one forgets them all. In this case too much evidence and too much argument had been administered and I felt that I remembered nothing. In such circumstances it was highly embarrassing to have to come to a decision, for not only was the evidence forgotten, but what was remembered was the difficulty I had had in appreciating its import. My fellow jurymen, however, had no such embarrassment. There were no grounds for believing that they remembered better than I did the evidence they had heard. But they were quite contented. They were practical men, and as such were not accustomed to the elaborate reasoned arguments that are habitual with the expert. The fact that they had forgotten the details of the evidence

did not matter to them at all. They at once came to a unanimous conclusion that the prisoner was guilty. They made no apparent effort to use their reason. They relied on their common sense, that is to say on their subconscious judgement. On the second occasion that I served on a jury, profiting by my previous experience, and being aware of the value of forgetting, I made no effort to remember the evidence and found no more difficulty than did the other jurymen in forming a opinion.

The authority, from whom the opinions of lawyers on the jury system are about to be quoted, remarks that "Juries are generally right, more often indeed than judges and counsel, because they judge from a common-sense point of view." The judge and the counsel, having a better power of appreciating and remembering the evidence than the jury, have it at their fingers' ends. So long as this is the case they are confined to those reasoned decisions that in the complicated affairs of life and when dealing with our fellow men are often of less value than the judgements of our subconscious mind. The judge and counsel use reason and can only use reason because the facts of the case are present to their memory. The jury have for the most part forgotten the facts. Hence they cannot employ reason. They therefore give a common-sense verdict by an action of the subconscious mind, thus arriving at once at a result that could only be reached after much delay if reason intervened. "Sometimes," said Sir Archibald Smith, "I think the verdict of the jury is wrong and I feel disappointed in it, but I think the case over, and I find on reflection that the jury were quite right."

The judge and the counsel at the time must have their minds dominated by their knowledge of the case, both because it has been recently acquired and because it has been acquired as the result of their own effort and research. That knowledge thus acquired is inimical to duly balanced judgement will be shown when we come to consider the mental limitations of the

globe-trotter. Further evidence is found in the common advice to sleep over a thing before deciding. Such advice is only given and is only appropriate when an act of judgement is required on recently acquired knowledge in which one happens to be interested. One's interest in the matter, by keeping the facts within reach of consciousness, keeps them away from the purview of the subconscious mind: we are therefore in a position to treat them with our reason but not with our subconscious judgement. After, in a change in the current of our thoughts and a night's sleep, when the facts in question are no longer so vividly present to our consciousness, we are in a position to use the subconscious mind besides our reason in coming to a decision.

A corollary from the above explanation of the value of juries is that one would not expect professional or expert jurymen to be a success. They would get into the habit of remembering too much of what they had heard. They would be liable to be overimpressed by some detail of the evidence; and this they would use in a reasoned argument instead of arriving at a common-sense verdict.

Another corollary is that the success of the jury system in England and America is not by itself a proof that it would be a success with other nationalities. Indians, for instance, often have far better memories than Englishmen. Hence it is possible that a jury of Indians would use or tend to use reason instead of their subconscious judgement. I merely throw out the suggestion. No evidence is at my disposal bearing on the point. Lombroso has strongly criticised the jury system in Italy. He admits that it is a success with Anglo-Saxons but asserts that, in Italy, jurymen are too often influenced by matters outside the evidence they have heard.\* But Lombroso's arguments are of a somewhat *a priori* nature and it would be advisable, before accepting his views, to learn the opinion of Italian legal authorities on the subject.

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\* "*Crime and Its Remedies*" 1911, p. 353



It will be worth while to devote a little more discussion to the jury system. In the first place, the suggestion that its value is that it elicits the average opinion of twelve men will not hold water. A jury does not give "average" verdicts. It gives extreme verdicts—"guilty" or "not guilty." Secondly, a jury can not be compared with that kind of committee known as a Royal Commission. For a committee of this kind persons eminent in different branches of the subject are carefully selected. They can and do use their reasoning powers, as they have time and capacity for this method of mental activity. Months or years may elapse before they agree on their report. They are not expected to arrive at an immediate conclusion as is a jury.

Neither is it fair to compare a jury with a committee formed by the heads of separate government departments who confer together on some administrative point. Here the members are all men of administrative experience who are accustomed to serve on committees. Committees of this nature have stood the test of experience.

The members of the jury are men chosen at haphazard, men presumably ignorant of law and unaccustomed to balance legal evidence. The kind of committee to which a jury may fairly be compared is one chosen in a haphazard way, a committee whose members are appointed to represent some interest or because they have some claim and not because of some special qualification for the task. There is a widespread opinion that a man is not at his best when on such a committee. Certainly, it often happens that on such committees the biggest fool has the longest tongue, and that the man who talks most carries the day. Similarly it has been said by Macaulay that no army commanded by a debating society was ever led to victory.

Reference has been made to the opinions of eminent legal authorities on the subject of juries. None of them complain that the man with a longest tongue has an undue influence

on juries. None of them say that a man on a jury is not at his best. On the contrary they find that a jury is the best means of arriving at a rapid conclusion on a matter of fact. If it were merely a question of getting an average opinion of twelve men a committee ought to be even more successful than a jury. But it is not. The difference lies in the fact that in a law court there is division of labour. Some, the witnesses, bring forward evidence. Others, the counsel, discuss it. The judge sums up ; while the jury only listens and gives the verdict. On a committee each member acts, or may act, both as witness, as advocate, as judge, and as jury. The members of a committee themselves bring forward the evidence. It is present to their consciousness. They remember it and therefore they can only reason about it. The members of a jury do not produce evidence by their own exertion. There is nothing therefore to impress the evidence on their consciousness. It is flung at them in such quantities that their consciousness can only retain a vague general idea of its nature. What they have forgotten is at the disposal of their subconscious minds. They therefore arrive at a verdict by an effort of subconscious judgement. As with the previous instances quoted the forgetting of details is a prelude to the activity of the subconscious mind.

The practice of appointing persons who are not administrators to the heads of administrations may be explained and defended in the same way as the jury system. A functionary holding such a post knows but little of administrative details. The reasoned views on any point in the government of a Crown Colony, for example, are put before him together with the comments of the permanent officials of his office. If he is a normal individual it is almost impossible for him to reason adequately on the details of the subject. He therefore is obliged to rely on his subconscious judgement. The comments of the permanent officials correspond to the summing up of the judge, while he himself represents the jurymen who give the verdict.

*A priori* one would expect that difficulties would arise if the individual appointed to such a post was a man whose reasoning powers had been abnormally developed.

The importance of subconscious judgement, though under other names, has long been recognised. In describing the reform of the currency in the reign of William III, Macaulay refers to two philosophers who helped in deciding what was to be done as men "in whom habits of abstruse meditation had not impaired the homely good sense without which even genius is mischievous in politics." The philosophers discussed the problem with two politicians and Macaulay says: "It would be interesting to see how the pure gold of scientific truth found by the two philosophers was mingled by the two statesmen with just that quantity of alloy which was necessary for the working." Evidently the alloy here referred to is what has been described as the power of subconscious judgement.

The following story told of Lord Mansfield well illustrates the superiority, in certain cases, of the subconscious judgement over reason.

But first let me explain that Lord Mansfield (1705-1793) was one of the greatest English lawyers. He is regarded as the founder of British mercantile law. His judgement in "*Mostyn v. Fabrigas*" is a landmark in the history of the constitutional law of Great Britain. It happened that a friend of Lord Mansfield was appointed Governor of a West India Island. He told Lord Mansfield that the one thing he dreaded about his post was that he would have to sit as a judge and decide cases. Upon which Lord Mansfield advised him to decide according to his notion, of common sense, but never to give his reasons; for, said he, "Your judgements will probably be right, but your reasons will certainly be wrong."

Thus one of the greatest of English lawyers, whose profound knowledge of law enabled him to rely on reasons advised his friend, who knew but little law, to mistrust his

reason in legal matters and to rely on his subconscious judgement.

There was a curious sequel to the story. Many years afterwards, Lord Mansfield, while sitting on Privy Council appeals, had a judgement of this Governor brought before his Court, which seemed so absurd in its reasons that there was serious clamour for the recall of the Governor as incompetent. It was found, however, that the decision itself was perfectly right. It appeared that, at first, the Governor had acted on Lord Mansfield's advice by deciding without giving reasons; and, finding that he acquired a great reputation by these decisions, began to think himself a great lawyer, and then at length took to giving his reasons with the above-mentioned result.\*

We next come to an example of a mental activity about which there is room for doubt whether it is due to reason or to subconscious judgement. Every barrister is aware that in cross-examination, especially in criminal cases, it is important to know when to stop. If one does not stop at the right point evidence may be elicited that helps the opposite side instead of one's own. Experienced barristers can stop but inexperienced barristers sometimes can not stop at the right point. (4) The barrister has to make up his mind when to stop on the spur of the moment. Generally it is the answer that he has just received, perhaps an unexpected answer, that determines him to finish his questioning. Barristers can sometimes reason very quickly. They may be conscious of their reasons for stopping but there is at least a possibility that they use their subconscious judgement instead of their reason on such occasions.

An interesting example of the power of subconscious judgement is offered by the journalist who rapidly writes a brilliant descriptive article on the spur of first impressions. This facile writing of the journalist may be contrasted with the

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\* Croake James, "*Curiosities of Law and Lawyers*" (Sampson Law London, 1882), page 59.

method perforce employed by the expert. In an article giving advice to young experts on composition, I found the recommendation that they should use a very large waste-paper basket. On any point several possible methods of arranging the data will occur to the expert. He has to make a choice by a slow and laborious exercise of his reason. The journalist probably only thinks of one method of expressing himself, or if other ideas do occur to him, they make no strong impression on his consciousness and he has no difficulty in discarding them. Probably everyone who has composed will agree that sometimes he can write rapidly, as does a journalist, and sometimes slowly, as does an expert, and that he has experienced every intermediate degree of facility in composing.

The most plausible explanation of these differing modes of composition is that numerous ideas occur alike to the journalist and to the expert, but that only in the case of the expert do they all come through from the subconscious mind into consciousness. It may be suggested that the subconscious mind of the journalist is so constituted that it exercises choice and sends on to consciousness only the chosen mode of expression. Hence his reason has little or no occasion to hesitate between alternatives. If this explanation is correct, one would expect that practice in exercise of the reasoning powers, though useful to the scholar, might be detrimental to the journalist. As evidence pointing in this direction I may quote the following opinion, expressed by Mr. G. Ranger Gull, in a novel written, it may be said, with a serious purpose :—

“ In popular and semi-popular journalism, the University man is nearly always a failure. He has not the faculty of feeling the public pulse. His images his judgements are literary when they are merely narrow.” \*

Thus the evidence brought forward in this chapter shows

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\* “ Back to Lilac Land,” p. 185.

that there are two methods by which the mind can tackle a problem. It may do so either by an effort of reason or intuitively. These alternative methods may be exemplified with the help of the following story.

Tennyson wrote a poem called "The Vision of Sin" in which occur the lines :—

" Every moment dies a man,  
Every moment one is borne."

When this poem was published it came into the hands of the mathematician Babbage the well-known inventor of a calculating machine of great scientific interest. He thereupon wrote to the poet as follows :—

" In your otherwise beautiful poem, there is a verse which reads :—

" Every moment dies a man,  
Every moment one is borne."

It must be manifest that were this true, the population of the world would be at a standstill. In truth the rate of birth is slightly in excess of that of death.

I would suggest that in the next edition of your poem you have it read :—

" Every moment dies a man,  
Every moment  $1\frac{1}{16}$  is borne."

Strictly speaking this is not correct. The actual figure is a decimal so long that I cannot get it in the line, but I believe  $1\frac{1}{16}$  will be sufficiently accurate for poetry. I am etc." \*

Most people on reading this story will at once see the absurd incongruity of Babbage's criticism by an instantaneous action of their subconscious minds. Conscious thought lasting perhaps for several seconds would be required before they could give reasons for their judgement. But it is not everyone who has his mental activities arranged in this way. On different

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\* Quoted in the *Scientific American*, 26th September, 1914, page 247.

occasions I told the story to two distinguished experts, men in whom the expert mental disposition was well developed. In each case there was a pause of a second or two before they began to laugh at the story. One of them while laughing gave me his reasoned arguments for regarding the incident as absurd. In each of these instances the expert apparently saw the joke not by intuition, but as the result of a reasoning process.

#### NOTES.

(1) Sir William Robertson expressed himself about Lord Kitchener as follows :—

“ Kitchener had a most extraordinary instinct in military matters. He never thought things out. He seemed to know them. This faculty of his amounted to genius. People who criticise him for his mistakes forget that he was seldom wrong in the big things. Some infallible instinct guided him in matters of life and death.” Such criticisms of Lord Kitchener as I have seen in newspapers have almost entirely dealt with matters in which Lord Kitchener had to use his reason rather than his subconscious judgement.

(2) a. As an illustration of the methods of Sherlock Holmes being used in real life the following story told of the late Sir Astley Cooper may be quoted. A man sitting at a table in a room at an hotel at Rotherhithe was murdered by someone who opened the door and shot him with a pistol. From the position of the body, the position of the wound, and the position of the door Sir Astley Cooper deduced that the man who fired the shot must have been left-handed. A man named Patch was arrested on suspicion. He denied that he was left-handed. At that date it was the custom for an accused to hold up his hand when pleading guilty or not guilty. Patch, unfortunately for him, held up his left hand when so doing. He was convicted and executed.

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\* An interview published in the *New York Times*.



(2) b. A box of calcined bones was sent to me and I was requested to report whether they were the remains of a man or a woman. No fragment of the bones was more than two inches long. I found attached to one of the fragments a piece of green glass of the colour commonly used in India for women's bangles. The glass had a shape that suggested that it had dropped on to the bone when in a fused condition. I reported that this observation suggested that the bones were of a female if, in the district from which they came, glass bangles were worn by women and not by men.

(2) c. It is obvious that the above two instances are of an exceptional nature and are far from proving that the methods of Sherlock Holmes could be used by any finite intelligence in most of the affairs of life. The following instance of a failure in applying such methods resembles far more what is likely to happen in practice. An elderly lady had died at Mussoorie, an Indian hill station, under circumstances that suggested poisoning. Prussic acid was detected in the portion of her viscera that was sent me for examination. There was no evidence as to how this poison had been administered. The ashes from the grate in the lady's bedroom were also sent. In them was found a veronal tabloid. I noticed that it was thicker than a veronal tabloid from a bottle of these tabloids found in the bedroom and that had been examined a fortnight previously. The difference in thickness was about half a millimetre. I put one of these tabloids in my mouth for a few seconds, spat it out, and kept it for a few hours in a closed space. It was then found that it had swelled up and was now of exactly the same thickness as the tabloid found in the ashes. The obvious inference was that the lady had put a tabloid into her mouth before going to bed, had felt the symptoms of poisoning coming on, and had therefore spat out the tabloid, got into bed, and died. Hence, I concluded it was a case of murder and not suicide. Fortunately I kept my opinion to myself and merely



reported the facts. It afterwards transpired that a doctor, who came into the room after the death was discovered, had found the bottle of veronal tabloids, had taken one out, bitten off a small piece, and then spat it out into the fireplace. I had noticed that a very small piece of the tabloid was missing. I thought this had been broken off by the tabloid, when spat out, having hit the firebars or the back of the fireplace. Sherlock Holmes no doubt would have had in his head a complete knowledge of the fragility of sucked veronal tabloids and of their velocities when spat out into fireplaces by aged ladies and young doctors respectively, and would thus have been able to distinguish between the two possible ways for the coming of a veronal tabloid into the ashes, but obviously it is far from feasible for a detective to have his head as full of detailed knowledge on an infinity of trivial matters as would be necessary if he were to use the methods of Sherlock Holmes in every case that came in his way.

(3) a. "As a rule," said Sir Edward Carson, K.C., when interviewed on the subject, "juries return good verdicts. I should prefer a jury's verdict to that of a judge, and I think it a great pity that judges should interfere so much with the free exercise of their opinion by juries; in many instances, indeed, usurping their functions, for the juries naturally don't like to set up views against the experience of a trained judge."

(3) b. "A jury assisted by a judge is a far better tribunal for the elucidation of the truth than a judge unassisted by a jury," observed Sir Alexander Cockburn.

(3) c. "A jury is, in general, far more likely to come to a right decision than a judge," remarked Chief Justice Erle. "As a rule juries are, in my opinion, more right than judges."

(3) d. Some years ago Lord Halsbury, addressing the United Law Society, said:—"For myself, I will avow that trial by jury is too often lightly regarded, and that it is one of the surest foundations on which civil rights repose. As a

rule, juries are, in my opinion, more generally right than judges."

(3) e. The Late Lord Russell of Killowen held a very strong opinion on the value of a jury as judges of matters of fact. He always thought that the average opinion of twelve men of common sense was at least equal to the judgement of twelve judges on matters of fact.

The above opinions on the value of juries are from a book by Mr. H. E. Fenn, called, "*Thirty-five Years in the Divorce Court.*"

(3) f. Mr. Sergeant Ballantine says:—"During my experience I have rarely known a thoroughly innocent person convicted, although there are certain charges scarcely sustained by strict evidence, but which carry with them a moral conclusion, and in which juries are apt to reject law and yield to prejudice; but little evil arises from such results, and substantial justice is obtained. I must, however, except one class of case in which I have seen very grave errors committed by juries, and I fear many innocent people have suffered. I allude to charges preferred by women against the opposite sex. Juries in many of these instances seem to bid adieu to common sense. The tears of a good-looking girl efface arguments of counsel and the suggestions of reason. However absurd and incredible the story told may be, a fainting fit at an appropriate time removes from their minds all its improbabilities. I have often wished that such charges might be disposed of by a jury of matrons." If it be true that the minds of women are more intuitive than those of men, and if my view of the nature of the jury system is correct, it would seem advisable for women to be allowed to serve on juries generally as well as in the special class of cases referred to by Mr. Sergeant Ballantine. \*

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\* "*Some Experiences of a Barrister's Life,*" by Mr. Sergeant Ballantine, p. 103.

(4) 'a. The following story, told me by the late Sir George Paget, is a striking example of a barrister not knowing when to stop his cross-examination. A man named Thurtell, a gambler, was indicted for the murder of a person at some time early in the nineteenth century. A junior counsel for the defence was cross-examining a barmaid at an hotel that Thurtell was supposed to have visited at the time. It was vital for the prosecution to prove that Thurtell had done so. The barmaid recognised the man in the dock as having come into the bar on the day in question though, as she admitted, she had only seen him before on this single occasion. "How many visitors do you have in the bar every day?" asked the counsel. "Between a hundred and fifty and two hundred," replied the barmaid. The senior barrister for the defence at once, by a gesture, attempted to hint to his colleague that he should ask no more questions. Unfortunately for the prisoner the hint was not taken. "How can you expect me to believe that you can remember one particular man," asked the counsel, "out of a couple of hundred that come daily into your bar?" "When I saw him," replied the barmaid, "I thought him the most good-looking man I had ever seen." The jury looked at Thurtell and saw that he was good-looking. This sealed his fate. He was convicted and executed.

(4) b. The following is an instance of a barrister knowing when to stop his cross-examination. A woman was under trial for poisoning her husband. She was defended by Ballantine who suspected she was guilty. The following is taken from his account:—"It is sufficient to say that a minute quantity of arsenic was discovered in the body of the deceased, which in the defence I accounted for by the suggestion that poison had been used carelessly for the destruction of rats. Mr. Baron Parke summed up not unfavourably to the prisoner, dwelling pointedly upon the small quantity of arsenic found in the body, and the jury without much hesitation acquitted her.....Dr.

Taylor, the professor of chemistry, and an experienced witness, had proved the presence of arsenic, and, as I imagine, to the great disappointment of my solicitor, who desired a severe cross-examination, I did not ask him a single question. He was sitting on the bench and near the judge, who, after he had summed up and before the verdict was pronounced, remarked to him that he was surprised at the small amount of arsenic found ; upon which Taylor said that if he had been asked the question he should have proved that it indicated, under the circumstances detailed in evidence, that a very large quantity had been taken. The professor had learnt never to volunteer evidence, and the counsel for the prosecution had omitted to put the necessary question. Mr. Baron Parke having learnt the circumstance by accidental means, did not feel warranted in using the information, and I had my first lesson in the art of "silent cross-examination." \*

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\* Ballantine, loc. cit. p. 161.

## CHAPTER. IV.

### THE MEMORY OF THE EXPERT AND THE MEMORY OF THE PRACTICAL MAN.

**The Memory Compared to a Warehouse—Forgotten Impressions Still Stored in Upper Chambers of the Mind—Facts only Available for use of Subconscious Mind when Forgotten or Partially Forgotten—Experts Remembering Facts Learnt at School—Business Men, Administrators and Engineers have Forgotten Such Facts—Good Education Hostile to the Development of the Business Instinct Despite its Advantages in other respects—Bankers and Education—Abnormally good Memory Accompanied by Deficient Initiative—Successful American Business Men and their Education—Summary.**

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When an under-graduate at Cambridge, I joined some friends in a study of hypnotism and we succeeded in producing some ordinary hypnotic symptoms in several of our fellow-under-graduates. One of them having been hypnotised was asked to describe "Bunsen's ice calorimeter." This he did, going to some detail, and even gave the formula involved in using the apparatus. When he came to, he was asked the same question. "I never heard of it" said he, "I don't know what are you talking about."

This incident is an example of the well-established fact that a hypnotised person can remember many things that he has forgotten when in his normal state.

It is now known that a forgotten impression is still stored in the brain, though it can no longer be recalled to consciousness. The memory may be regarded as a mechanism for forgetting. It is a mechanism that decides which of the numerous impressions we are constantly receiving should be stored in the brain within reach of consciousness, and which should be stored beyond its reach. The mind has been compared to a warehouse. Some of the goods are stored on the ground floor, and are immediately available to consciousness. Others are on the first

floor, and can only be recalled to consciousness under the influence of some special stimulus. Others are on the higher floors, or in the attics, and can never be recalled to our consciousness in its normal state, though their existence may be revealed by hypnotism or in the ravings of fever.

Two reasons are commonly given why this mechanism for forgetting should exist. First, that life should not be too burdensome. We enjoy reading a newspaper, but it would be a very different matter if we could not do so without remembering every word we read. Secondly, if our consciousness were clogged with too many data, our reasoning processes would be too slow. We should take an interminable time in coming to a conclusion. Details would unduly impress us, and we should fail to see the forest because of the trees.

Facts described in the preceding chapters indicate a third reason why we should possess the mechanism for forgetting. So long as a fact is remembered it is within reach of consciousness, and is inevitably used in conscious reasoning. In various instances it has been shown that data only become available to the subconscious mind when they have been forgotten, or are so vaguely remembered (as occurs with a jury) that they are no longer capable of being used in a reasoned argument. Hence it would appear that the act of forgetting is a necessary condition for the activity of our subconscious judgement. My readers will see that if this is true it is a very important matter ; for it would appear to follow that undue development of the memory must be detrimental to the development of the powers of the subconscious mind. It is necessary to seek for other proofs of the truth of this conclusion.

1. *In the first place, one would expect an expert, who habitually depends on reason, to have a different kind of memory from that possessed by a practical man, who in his daily life depends not on reason so much as on subconscious judgement.*

To adduce evidence as to the power of memory possessed by different types of men is not easy. Some people have the most mistaken ideas as to the goodness or badness of their memory. An expert, of my acquaintance, thinks he has a bad memory because he sometimes goes to his breakfast and finds that he had already eaten it an hour before. He overlooks the fact that he has an exceptional power of remembering scientific facts connected with his work. A business man, who remembers with ease the variations in the price of some commodity for perhaps a year past, thinks he has a good memory, regardless of the fact that he remembers reasons so badly that he is incapable of properly following a reasoned argument.

We have especially to consider the power of remembering things learnt with effort or things that we recognise as important. This kind of memory is often known as the "reasoned memory." Evidence is available that the expert generally remembers for a longer time things learnt with effort than does the practical man. For instance, every expert I have questioned on the point, when in middle life, remembers a good deal of what he has learnt at school. An expert, who sometimes forgot whether or not he had had his breakfast, was able to recall much of Latin and Greek, though he had had no occasion to call these subjects to mind since he was a boy. He could, he assured me, repeat by heart whole pages of Latin authors. On one occasion a geological expert was talking to me on some geological matter. Presently he got out of his depth and excused himself by saying he had got rather rusty on geological matters, having been away, for the last two years first at the war in Mesopotamia, and afterwards on munition work. I at once asked him what he remembered of his school learning, and found he could still recall something of Latin, Greek, and Euclid, just as well as can other experts.

On the other hand men of business generally, when in

middle life, have completely forgotten their school learning. One has been quoted who had taken prizes for mathematics, but who was unable to define parallel straight lines. Others were unable to recall a single word of Latin or the title of a single proposition of Euclid. An engineer was similarly unable to recall any Euclid, which, as he said, was remarkable, since he was constantly using geometrical methods in his work. Another engineer, a very capable man, on the other hand, had some recollection of his school learning. But he was in the habit of making inspections without taking notes and writing out his inspection reports at the end of his day's work. Thus he had frequent practice in calling things to mind—the surest way of improving the memory. My questions have been put to practical men of many different kinds, and from their answers it was found they had uniformly forgotten their school learning with one interesting exception.

This exception was a business man who seemed to be unusually intelligent. I have heard him make a Latin quotation that was not at all hackneyed and criticize someone else's quotation in a way that showed he retained a working knowledge of the Latin Grammar. This man was full of well thought out schemes for making money. But the unfortunate thing about them was that they always turned out badly. His reasoning power was good, but he lacked the business instinct and his name was synonymous with failure.

Members of the Indian Civil Service very frequently have the greatest difficulty in recalling even the titles of the subjects they took up for their entrance examination. One who had specialised in oriental languages had forgotten Latin and Greek.

However, a few instances are known to me of business men and Indian civilians who keep up an interest in the classics. But it is a question whether what they have retained is a memory for facts learnt or a capacity for translating from



classical authors. One civilian told me that though he enjoyed reading classical authors he had completely forgotten all details of grammar or syntax.

Thus the evidence available goes to show that men, such as experts, who habitually use reason, have better memories for things learnt with effort than have business men or administrators, who habitually depend more on subconscious judgement than on reason.

Exceptions to this rule are however known to me. For instance, both Field-Marshal Sir Evelyn Wood and Bismarck appear, from their biographies, to have been able to remember in later life much that they had learnt in their earlier years. But both these exceptional men were distinguished for their powers of initiating new schemes that must have made much demands both on reason and memory. Their mental activities therefore must often have been widely different from those chiefly employed in the routine work of administrators and business men.

II. *If what one forgets subserves the subconscious mind and what one remembers subserves reason, then one would expect that the expert with his abnormally developed reasoning power and his heavily loaded memory should be deficient in the higher powers of the subconscious mind such as the business instinct or the instinct of the financier.*

Abundant proofs that experts generally lack the business instinct will be found in later chapters. It will be shown that in every instance in which an expert has shown business ability he has been a business man first and has acquired expert aptitudes later.

III. *If forgetting is a necessary prelude to the activity of the subconscious mind then, since the main apparent object of education is to develop memory, one would expect it to be possible to show that a good education is hostile to the development of the business instinct.*

It is quite a usual statement in the biographies of self-

made men that they resolved that their sons should have a good education, they themselves having been, as they think, greatly handicapped by the lack of it. If, as usually happens, the sons fail to achieve notoriety, this is no proof that their education has checked the growth of their business instinct, for it is possible that their inferiority is due to their lacking the stimulus to exertion that had aided their fathers. On the other hand the conditions are different if we have to deal with two brothers who are under an equal necessity of pushing their way. If one is well educated and shows no business instinct, then we have some evidence of the kind to be expected if my views are correct. Two instances of this nature will now be described.

In an earlier chapter a business man of my acquaintance was quoted as Mr X. The following is a further account of his mental equipment.

Mr. X. had a bad school education because it was constantly interrupted by periods of ill health and the results of several serious surgical operations. It was only at the age of eighteen that he found himself with a good constitution.

He was apprenticed to a manufacturer and showed sharpness, energy and initiative. He was selected to represent the firm as a travelling agent, and, at present, is a foreign "commission agent" for several firms dealing with various kinds of manufactured articles.

As his memory had never been developed by his school education, he has no aptitude for languages.

As a young man he felt the handicap of having a bad memory so he determined to improve it. This he did by writing out at night all he could remember of the accounts and orders he had had to do with during the day. He was so successful at this that he can now remember orders or promises that he made two years previously.

But this memory is entirely special and limited to this one thing. He frequently forgets whether he has had his lunch.

An unusual characteristic in a business man is that Mr. X. is a great reader of books, and when travelling he carries his library catalogue with him. This I looked at. It appeared to me remarkably well chosen. It contained books relating chiefly to sociology, history, history of religion, travel, and the geography, of the countries he was in the habit of visiting.

Mr. X. has the power of forgetting in a remarkable degree, so much so that if he sees the title of any of his books he is unable to recall the contents. Like other business men he has forgotten all he learnt at school. He was unable to quote a single Latin word when I challenged him to do so.

Although he forgets so thoroughly, he says that facts are apt to return to his consciousness when needed. Though he has forgotten the French and Latin he learnt as a boy, what he learnt, he says, helps him in understanding a few French or Italian phrases when travelling in countries where these languages are spoken. What he remembers depends very much on the environment. He knows a few words of Hindustani, but can only recall them when in Northern India. He could not recall a single word of Hindustani when travelling in Madras where this language is not spoken. He asserted that, though he forgot the contents of the books he read, some of what he had learnt would come back to him when he wanted it. When he said this, I at once asked him whether the Malayan fire-piston (a primitive method of producing fire) was mentioned in any of his books.\* He had not heard of it and told me it was not mentioned in Fraser's *Golden Bough* or in books by Wallace or by Skeats and Blagden. Though he showed some memory in this case, I found that in general the stimulus of conversation was not sufficient to recall to his conscious mind anything more than the vaguest conceptions

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\* See Henry Balfour, "The Fire-Piston" in "Anthropological Essays presented to E. B. Tylor on his 75th birthday" (Oxford, Clarendon Press, 1907).

of the contents of the books he had read. His conversation consisted of the usual mixture of trivialities with a few shrewd remarks that one would expect from a business man. Mr. X. is not a plausible or excessive talker. I obtained independent evidence of his ability as a business man. He has an exceptional position in his line of business.

He has no faculty for becoming interested in unimportant things. Like other business men the word "interest" to him has some connection with "dividend." He only has interest for matters that affect his pocket. Practice in calling things to mind as a means of improving the memory has already been mentioned. Another stimulus to memory is interest. What one is interested in, one remembers well. Mr. X. in spite of his capacity for forgetting things that are unimportant to him, has a good memory for things in which he is interested, such as the details of his business. He once was offered an agency in certain hardware manufactures. He accepted on the condition that he should be allowed to spend four days at the factory learning technical details. This he did and learnt up the subject thoroughly. He gave me a somewhat minute account of a case in which this technical knowledge had been of great use to him in India.

Thus Mr. X. presents an instance of great business ability, initiative and power to learn new things or take up new lines of work, in a man who had had a bad school education. The following description of a brother of Mr. X., whose school education had been good, will serve as a sort of contrary observation.

This man had a well developed memory. He acquired an expert turn of mind and became an analytical chemist. He obtained a post with a company that sold a certain product made in plantations in various eastern countries. As his memory was well trained, he had no difficulty in learning well six languages spoken by various people he met while in the

east. Also in virtue of his good memory he was able to become expert in estimating the value of the shares of various companies dealing in the product in which he was interested. Owing to this knowledge he made a good deal of money by speculating in these shares, and has given up his chemical work. He has been able to do this, not owing to any business instinct, but as a result of sheer hard work, memory, and reason. Owing to his lack of business instinct, though he knows what to buy, and though he generally knows when to buy, he sometimes does not know when to sell. Reason may show that certain shares are likely to rise, but I am informed that business instinct would be required to say when the rise is coming to an end and about to be followed by a fall. He has made a fortune, lost it, and made another. He is not adaptable. He has little initiative and is only good at this one thing—namely, knowledge of a certain class of shares on which he is a recognised authority.

Thus, of these two brothers, one had a good education, a good memory and no business instinct; the other had a bad education, a bad memory, though a useful one, and a highly developed business instinct.

A similar example is to be found in the life of George Moore, merchant and philanthropist.\* George Moore was a country boy of bad education who came to London and pushed his way. He was acutely conscious of the handicap of his bad education and wrote to his father urging him to give his younger brother William the best education obtainable. "It is," he wrote "the best thing you could furnish him with in setting out in the world. It is better than money. Education will enable him to start fair in the world and to push his own way." The biographer says, "William was accordingly sent to the best schools. He was a far apter learner than George had

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\* By Samuel Smiles, (George Routledge and Sons, London, 1878) page 68.

been. He had read extensively, and was well versed in literature. But he wanted that in which his brother George was supreme, intense perseverance. He knew much and did little. He could think, but could not work. Nevertheless, George had much confidence in his brother William, because of his superior education and his extensive knowledge." If this statement is true the confidence appears to have been somewhat misplaced; for William had neither perseverance, nor business instinct, nor initiative, qualities for which his badly educated brother was specially distinguished. Two similar instances are known to me of families in which a badly educated son showed more business ability than other sons who had a better education.

It is very generally recognised that the more erudite products of our universities are not, as a rule, very capable at business. It will be of interest to quote two opinions to the effect that even ordinary school education may check the development of business ability.

Stephen Leacock thus sums up his experience as a school-master in Canada :—"I have noted that of my pupils those who seemed the laziest and the least enamoured of books are now rising to eminence at the bar, in business, and in public life ; the really promising boys who took all the prizes are now able with difficulty to earn the wages of a clerk in a summer hotel or a deck hand in a canal boat." \*

In a debate on an Education Bill in the British Parliament in 1918, a member expressed himself as follows :—"It was said that education was necessary to make the rising generation good business men. His experience in the City was that the man who took firsts at Oxford generally came out last and the man who could hardly write his name generally came out first. The explanation was that education could not put into a man that instinct of self-preservation and common sense which was the foundation of all success in business. How could education

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\* (Preface to *Sunshine Sketches of a Little Town*.)

assist a farm labourer to spread manure on a field? The best labourer he had known was wholly illiterate. If the waste of war was to be replaced it would be necessary for the young to start as early as possible in doing a day's work, instead of wasting time on useless book learning."

These remarks were cited in an address before a learned society as an illustration of "the stultifying effect of a purely classical education," the member of parliament in question having been educated at "one of the most rigidly classical of our public schools."\* It will be of interest to see in what this stultifying effect consists. The speaker can scarcely have meant that there had been any stultifying effect on such subconscious mental powers as common sense, business acumen, or initiative, for he describes the member of parliament in question as being a director of one of the largest London banks and of one of the most important English railways. The stultifying effect, if not on the subconscious mind, must have been on the conscious mind, in other words on the reasoning power. Certainly, in the example quoted, the reasoning of this member of parliament is of a kind more suited for debate than for scientific discussion. He gives an explanation that can be easily criticised; he assumes that no answer is possible to a question that he propounds; he makes a somewhat rash and sweeping statement about "useless book learning." How does he know that the limited classical education he received was not of use, in that, by checking the precocious development of reason, or in some other way, it deflected his brain energy from consciousness to the subconscious mind and so aided the growth of the latter? The reasoning power and the power of subconscious judgement vary inversely to such an extent that it is by no means an irrational enquiry whether the discipline of dull and useless book learning that is bad for one may not be good for the other.

Indians have an unusual capacity for developing the

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\* Journal of the Chemical Society, April 1818, page 894.

memory by practice. It is only in India that one hears of a money-lender who, being illiterate, keeps all his accounts in his head, or of an accountant to a bank who depends on memory except for a few marks on a wall made with a piece of charcoal. Such abnormal memory appears to be entirely special to one class of data. The Indian student, who arouses the despair of his schoolmaster by learning a textbook by heart, without having properly assimilated its contents, is by no means distinguished for general knowledge.

Hence we may expect to find in India more than elsewhere proofs of the bad effect of undue stimulation of the memory on the subconscious mind. Such proofs are of the more value in that the intellectual ability of the mature Indian mind is undoubted. An Indian who has not had a college education frequently shows more reasoning power than an Englishman of similar standing.\* He often relies on reason on occasions when the Englishman would rely on his subconscious judgement. Nevertheless the opinion is widely held that western education has not yet done full justice to the Indian mind.

The celebrated Bengali chemist Sir Prafulla Rây has stated that "our university made a havoc of originality." Most of the prominent men in Bengal, he says, have no university degrees. Dr. Annandale, in giving evidence before the Calcutta University Commission, said :—"I have never in my own department appointed as a clerk or assistant any man who had a university degree.....It has been my experience that I could engage better men by ignoring university qualifications..... By better men I mean, not men who were better acquainted with rules and regulations or more capable of assimilating official routine, but men who were better able to

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\* This is exemplified by the fondness of Indians for litigation, which is an affair of reason not always controlled by common sense. For instance, Indians have been known to buy an estate because it was encumbered with one or two lawsuits just for the pleasure of fighting them.



adapt themselves to changing conditions and different kinds of work, even if their actual powers of intellect were not so highly trained." \*

Among the different races in India the business instinct is rarely, if ever, found in members of the more intellectual classes. On the other hand Mahomedans and Marwaris, who have had a very bad education, often have a highly developed business instinct. Business men have told me, that all the wholesale trade in certain articles in Calcutta and Bombay is in the hands of Mahomedan merchants.

Sir Prafulla Chanda Rây in a speech on the industrial position of India referred to "the illiterate persons of East Bengal who made handsome incomes from jute and other businesses and to the Marwaris and Bhattiahs who had almost ousted the Bengalees from the Calcutta industrial market..... The Bengalees would not count for more than four per cent in the business market of Calcutta."†

Mr. L. K. Ananta Krishna, Superintendent of the Ethnographical Survey of Cochin State in southern India, tells me that the Mahomedans in Cochin are known as "Moplahs." They originated from the union of Arab immigrants with women of the soil. Their mother tongue is Malayalam. Their education is next to nothing. They can read Arabic, but there are no scholars among them. They know enough arithmetic to calculate interest. They are good business men. The trade in hides is mostly in their hands. They predominate in both wholesale and retail trade in paddy, coir, copra, European manufactured commodities, pepper, timber, and other local products. Mr. Ananta Krishna tells me that, in southern India, educated Hindus may be found in retail but never in wholesale trade.

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\* Calcutta University Commission Report, 1917-1919, Vol. X. page 112.

† Reported in the *Times of India*, weekly edition, (April 30th 1919).

The above facts culled from a variety of sources fully prove that a good education is not necessary for the development of the business instinct. On the contrary, they give rise to the suspicion that education (or too much of it) checks the development of this instinct. The evidence brought forward, it may be noted, only throws suspicion on the advantages of education in this one respect.

Evidence may readily be found of the advantage to a business man of a good education in those businesses in which that form of rapid initiative which we call the business instinct is not required from beginners. For instance, educational qualifications are specially relied on in admitting candidates into the banking business and an experienced banker has informed me that he has noticed that boys who have done well at school do better as bankers than boys whose school life was not so promising. When boys are admitted into a bank, obedience and accuracy are far more useful to them than initiative and enterprise. At first the beginners are put to do routine work of the simplest kind. One, it may be, for some years has no other duty than to add up columns of figures; another is occupied in writing up pass-books; another has to take charge of addressing and despatching letters. If a beginner shows aptness in his work, the head of his department will make a point of changing him at intervals from one kind of work to another. But whatever he does it is all dull routine. After some years of dull discipline of this kind, without any further preparation, the young banker is suddenly promoted to the position of manager of a branch of the bank. Thus after a training in which he has no opportunity of exercising his initiative, he is put in a position in which he is expected to show, and generally does show, this power of the mind. Thus he exhibits the power of deciding what to do in business matters, not after practice in deciding, but after what may be described as practice in forgetting, for his dull work in adding up figures,

precisely because it makes no appeal either to his interest or his reason, is of a kind that is instantly forgotten.

On the other hand evidence is readily available that in banking, as in other affairs, routine work of one kind, if too long continued, is bad for the mental powers. The above description of the development of a banker is not vitiated by the fact that in special cases young bankers may be called on to pass an examination, for, as more than one banker has told me, but little weight is laid on its result.

A similar case is to be found in a book called "*Edison, his Life and Inventions*,"\* where attention is drawn to the curious fact that a large number of prominent American men of business began their careers as telegraph operators. Sending messages with a Morse key is not, as yet, a recognised means of culture, nevertheless a list is given in this book of twenty-one celebrated men of business, railway directors, etc., besides Edison himself, each of whom had begun his career in this way. There can be little doubt that each of these men had had nothing more than a restricted school education, but yet they were able to compete in business against others often more learned than themselves. Sending and receiving telegrams is work that involves taking in impressions rapidly that are as rapidly forgotten. Hence practice in forgetting, in an unusual amount, was, in these cases, followed by an unusual development of qualities that lead to success in business such as initiative and the business instinct.

Large engineering firms in some cases only admit men with university degrees in technical subjects. Such men do well in the positions in which they find themselves, but their work at first is mainly technical and they do not have to do work for which the business instinct is required. An engineer of wide experience told me that he once had under him a man

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\* By F. L. Dyer and J. C. Martin (published by Harper and Brothers, New York and London, 1910), page 60.

with a university degree. This man was admirable, he said, if he had to design a suspension bridge or anything of that kind but "he was no earthly use at commercial engineering."

IV. *The business instinct is a product of the subconscious mind. It is mainly a capacity for deciding to do the right thing at the right time. In other words it is a case of initiative. Since this is so, the question arises whether other forms of initiative are not also due to the subconscious mind, and whether our decisions to do things are not more often due to an act of subconscious judgement than to reason. We may test this possibility by seeing whether people of abnormally good memory are deficient in initiative.*

In order to put this matter to a test I put the following question to a large number of men:—"Do you know of anyone with exceptional memory and reasoning power who, in spite of these qualities, is not successful in his work?" Everyone asked this question has been aware of instances to the point, and everyone without exception has put his finger on the same mental defect. In order to be sure that I am not supporting any views of my own by picking cases to suit them, I will begin by giving the last six consecutive replies received by me at the time of beginning to write this chapter:—

(1) An officer, who had had a great deal to do with training officers for the new army, told me that the most unsatisfactory material for making officers out of, was school-masters. They were men of intelligence, ahead of the others in book-learning, and in capacity to learn. But when turned into officers, they were useless, because they completely lacked initiative. I have since met two other officers who have had the same experience. These opinions only go to show that officer school-masters were no use in positions in which rapid decisions were required. An account of another officer school-master, has been given me, who was distinguished for his capacity for drawing up well thought out schemes for

submission to his superiors. Such work demanded reason, foresight and originality rather than sudden decisions.

(2) The manager of the largest bank in one of the British dominions told me he knew a man who was extremely expert in the theory of banking and various problems of economics. He enjoyed visiting this man to have a chat with him on such subjects. But in actual business this man was "an absolute fool. He had no initiative."

(3) An engineer told me of an engineer of his acquaintance who was exceptionally full of book-learning. If methods of making such a thing as a culvert were discussed, he would describe the method adopted by English engineers and show how it differed from the method adopted by American, French, and Italian engineers. One day he was sent to make a culvert. It was at the side of a hill. He commenced by taking down a retaining wall that supported the side of the hill and that was in his way. Presently it began to rain. The hill started subsiding and the only thing to do was to put back the retaining wall as quickly as possible. But this did not occur to him. Nothing occurred to him. He telegraphed for assistance. In this and other cases he showed that he completely lacked what my friend called the "engineering instinct." Here again was an instance of too much learning accompanied by lack of initiative.

(4) The fourth person asked said he knew of many cases of men having much reasoning power and no initiative. He did not quote any particular case. He was an administrative officer of great common sense and a memory unburdened by useless information.

(5) An acquaintance who had been to a certain school told me it was notorious that the education there was so good that its boys were constantly getting scholarships and exhibitions at the universities. But it was also notorious that one never seemed to hear of them afterwards. He told me of one

case of an exceptionally clever man, who had been at his school, who passed first into some government department, but who "hadn't got sufficient initiative to tie up his bootlace. If you asked him to go for a walk, he would reason about it for ten minutes before he could decide what to do."

(6) The last was also an official and gave the same sort of reply as (4).

In view of the many opinions I have collected, it appears that the fact that people with too much memory and reasoning power are deficient in initiative may be described as something that everyone knows but that nobody realizes.

Edison is recorded as saying "What we need are men capable of doing work. I wouldn't give a penny for the ordinary college graduate, except those from the institutes of technology. Those coming up from the ranks are a darned sight better." To a question as to where he found the best young men to train as his assistants, in an interview with Mr. Poultney Rigelow, he answered emphatically. "The college-bred ones are not worth a d—— I don't know why, but they don't seem able to begin at the beginning and give their whole heart to the work." In commenting on this opinion Mr. Herbert Spencer says that the evidence available leads to the inference that the established systems of education, whatever their matter may be, are fundamentally vicious in their manner.

In this connection Mr. Herbert Spencer says :—"It is astonishing how general, among distinguished engineers, has been the absence of education, or of high education. James Brindley and George Stephenson were without any early instruction at all: the one taught himself writing when an apprentice, and the other put himself to school when a grown man. Telford, too, a shepherd boy, had no culture beyond that which a parish-school afforded. Though Smeaton and Rennie and Watt had the discipline of grammar schools, and



two of them of high schools, yet in no case did they pass through a curriculum appropriate to the profession they followed. Another piece of evidence, no less remarkable, is furnished by the case of Sir Benjamin Baker, who designed and executed the Forth Bridge: the greatest and most remarkable bridge in the world, I believe. He received no regular engineering instruction." It may be noted that none of these were men who joined large firms in which they gradually worked their way up. They were men who struck out their own line, with whom therefore, with one exception, there was demand for initiative from the start. Thus, in these cases, initiative in high degree was shown by men who had had a limited education. The exception was James Watt who was an inventor rather than an engineer. He says of himself—"I am not enterprising. I would rather face a loaded cannon than settle an account or make a bargain." Fortunately he got into partnership with a business man Boulton, who wisely left invention to Watt while he himself took charge of their actual business. Watt was self-taught and was distinguished for his fund of general knowledge. Thus unusual reasoning power (shown by his inventive capacity) and unusual memory (shown by his general knowledge) was combined with lack of initiative.\*

America seems to have followed Edison's advice in choosing "men capable of doing work" for the heads of various organisations needed in connection with the war. We may well believe she has picked her best men. Of these, Mr. Daniel Willard, who was in control of all transportation work, began life as a railroad labourer, then worked as an engine driver and gradually rose to his present position. Mr. Vanderlip, a banker, was the chairman of the British War Loan

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\* See *Edison, his Life and Inventions*, by F. L. Dyer and J. C. Martin, and *An Autobiography* by Herbert Spencer, Vol. 1, pages 167 and 337 (Williams and Norgate, London, 1904).

Committee in the United States. He then became assistant to the Treasury Secretary. He is the chief of the sixth biggest bank in the world. He began life as a reporter. Mr. Rosenwald who is in charge of "war buying of finished products," began life as an errand boy. He belongs to a large mail order house in Chicago and is reputed to have an income of a million dollars a year. Mr. H. P. Davison, a banker, formed a committee of bankers to help in war organisation. As he made £200,000 before he was twenty years of age he could not have spent any undue time on his education. Mr. John D. Ryan, Director of Aircraft Production, is said to be a self-made man. He is pre-eminent in industrial organising power. (*The Times*, April 27th, 1918). Mr. Robert Lovett, "a kind of reconstruction minister" also rose from the ranks. Mr. Charles M. Schwab, Director-General of the United States Emergency Fleet Corporation, as a boy drove a stage hackney carriage. At nineteen years of age he entered the service of the Carnegie Company as a "stake-driver." He gradually rose till he became President of the Bethlehem Steel Company. He is said to have spent a good deal of money on educational institutions, a fact that indicates that he recognises the value of education for others.

On the other hand Mr. Hoover, the Food Controller, took his degree in geology at Cornell University. But one of his fellow students has informed me that, before doing so, he showed business capacity in starting a laundry which turned out to be a great success. Therefore Mr. Hoover is not an instance of a man beginning as an expert and afterwards developing business capacity, but the reverse.

It will be convenient at this point to summarise the preceding argument. In the earlier chapters various instances were described in which impressions stored in the mind were only available for acts of subconscious judgement when they were so far forgotten that they could no longer be clearly



recalled, or recalled at all, to consciousness. These instances led to the suggestion that the process of forgetting, far from being a mental defect as is so often popularly supposed, is the means by which impressions are put at the disposal of the subconscious mind. If this is true, certain consequences must follow. First we should expect those who habitually rely on reason to have better memories than those who rely more on the instinctive powers of the mind. We have seen that the facts are entirely in accordance with this anticipation. Secondly, we should expect that persons whose memories were burdened with much learning would tend to lack such powers of the subconscious mind as the business instinct and the power of rapid decision. Considering the difficulty of the subject it is surprising how much evidence has been brought forward to this effect. Many instances have been adduced of highly developed business ability in badly educated persons and we have even found reasons for suspecting that education, despite its advantages in other respects, checks the development of the business instinct.

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## CHAPTER V.

### THE EXPERT AND THE PRACTICAL MAN

Difficulty of Reasoning with Business Men—The Business Man's Intolerance of Ingenuity—Concealment of Ingenuity by Lord Kelvin—The Business Man's Resentment at being Reasoned with—Inducing him to Use his Reason—Unwillingness of British Manufacturers to Introduce Improvements Demanded by their Travelling Representatives—The Remedy.

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REASON is the natural mental weapon of the expert. He uses it in his researches and in communicating with other experts. He naturally uses reason in communicating with practical men, and here he meets with difficulties; for he finds that his reason and the reason of the practical man are two very different things. Supposing, for example, an expert wishes to make an estimate of the probable cost of some commodity a year hence, he will take into consideration a large number of *pros* and *cons*. He will think of perhaps twenty reasons why the price should go up and twenty reasons why the price should go down. He will balance the evidence and at length come to a conclusion. A business man will arrive at a decision on the same point in a different way. He will think of not twenty *pros* and twenty *cons*, but perhaps one *pro* which seems to him overwhelmingly important and one or two *cons* which seem to him of trivial importance. He rapidly comes to a conclusion on which he relies, and on which the expert who asks him will also rely, if he has experience of such matters, although he knows that the business man's conscious reasoning on the matter has been far less elaborate than his own.

If the expert comes to a practical man with an argument that involves a large number of *pros* and *cons* the practical man is unable to follow him. He has an instinctive dislike of what he regards as a long-winded, reasoned argument. The reason that the expert relies on, is likely to arouse, not the reason, but the critical faculty of the practical man. Theoretically no doubt this faculty is a part of reason. In practice it is a singular

capacity for misrepresenting the evidence combined with a desire to do so.

If the expert's idea happens to involve such an elaborate use of reason that it appears "ingenious," it will arouse still more opposition. Indeed, everyone, including I am afraid the scientist, is apt to be intolerant of ingenious ideas, or, to be more precise, of the ingenious ideas of other people. How such ideas appear to a man of the common-sense type of mind may be illustrated by the following quotation—"There are as many unanswerable reasons to be given for as against most human decisions. Ingenuity and eloquence are a curse at councils of war, and state, and business. Indeed, wherever action of any kind has to be determined upon, they are a curse. It was Lord Roberts's special gift that out of the medley of unanswerable reasons, he had an instinct for selecting those which really mattered, and keeping his mind close shut against the rest." \*

This quotation well illustrates the mental method of the statesman and man of business as contrasted with the close logical reasoning of the expert.

One must sympathize with the practical man in his distrust of ingenious ideas. An idea, to appear ingenious, must have something about it that is unexpected and elaborate. Experience may well show that in the complicated affairs of life ideas having these attributes lead to unexpected and undesirable results. However this may be in political or social affairs, when we come to deal with the practical applications of science many of them must necessarily appear ingenious to the uninitiated, but, none the less, are useful in the highest degree. But the man of business is ignorant of this fact. The expert must therefore bear in mind that his ingenuity is likely to be counted against him as a fault and that the more elaborate his reasons the more opposition are they likely to arouse.

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\* "*Ordeal by Battle*," Preface, by F. S. Oliver.

The question arises what is the poor expert to do? If reasoned arguments are not a suitable means of communication with practical men, if reason is the expert's sole mental weapon, and if his reasons merely inspire opposition from people of common sense, how can he hope to get a fair hearing for his views?

In the first place, since ingenuity arouses opposition, ingenuity must be concealed. The following is an instance of this being done with successful result.

Lord Kelvin was the author of the plan of furnishing lighthouses with eclipsing lights in order that they could be easily distinguished. The dark intervals in the light were of two kinds, long and short, corresponding to the dots and dashes of the Morse code. A lighthouse might thus flash out the initial letter of its name. Now if Lord Kelvin had bluntly laid before the Admiralty his suggestion that lighthouses should advertise themselves in this way, the suggestion would probably have been recognised as an "ingenious" idea and as such it would have been opposed and scouted. He therefore, in the first instance, merely suggested that lighthouse lights should have long and short eclipses. Lights so arranged he said could easily be distinguished from the mast-head-light of a steamer. The authorities consulted used their own reasoning. They realised that they, as practical men, could easily distinguish a light that had a series of long and short eclipses from a light that had none. After the suggestion had been adopted Lord Kelvin allowed it to be known that the eclipses made dots and dashes on the Morse system. In a letter written in 1875 he says:—  
"But I keep in the background the fact that, adhering simply to the letters of the Morse alphabet, we can with the greatest ease give twenty-eight distinctions, each thoroughly unmistakable for any other. This has a tendency to frighten 'practical men.' " \*

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\* *Life of Lord Kelvin*, by Silvanus P. Thompson, Macmillan and Co., 1910.

In the second place, since the practical man's reason is liable to be eclipsed by all kinds of sentiments and prejudices, care must be taken to avoid bringing such influences into play. This was done successfully in the following instance.

Some years ago Mr. J. H. Field was starting the Aero-logical Laboratory in Agra. He intended to send up balloons two or three times a week. To each balloon a recording instrument was attached and a printed notice to the effect that the finder would receive a reward if he returned it to the Agra Laboratory. Mr. Field happened to ask me whether I thought the reward should be five or ten rupees. My reply was "If you offer such a big reward the man who finds the instrument will get suspicious. He is as likely as not to think it is magic or an attempt to spread plague or cholera. You had better offer a reward of only two rupees with a travelling allowance of one anna a mile for bringing the instrument to your laboratory or to the nearest police station. You will in this way appeal to his reasoning powers. The only idea in his mind will be how to cheat you of an extra anna by telling a lie about the distance of his village to the police station." Mr. Field has adopted the system of a low reward and a travelling allowance and has had a surprisingly large number of his instruments returned.

On one occasion a cultivator seeing one of the instruments falling mistook it for a ghost and promptly attacked it with his club. While doing so he happened to see the printed label. He read it, appreciated the anna a mile travelling allowance, at once understood the true state of affairs, and Mr. Field recovered the instrument.

As an example of an appeal to reason that failed because it also provoked prejudice an advertisement of a motor-bicycle, that appeared some years ago, may be quoted. "Why be so foolish," it ran, "as to think that because the X.Y.Z.-motor-bicycle wins all the prizes for racing it cannot also be used at safe speeds for ordinary purposes?" An advertisement that began

by asserting that prospective purchasers were fools, and that invited them to consider why they were fools, was likely to fail in its object and the proprietor of the machine was not long in finding his way to the bankruptcy court.

The worst offenders in this respect are journalists. If they wish Government to do anything, they support their views by crude and convincing reasoning, which not only proves that the thing ought to be done, but also that certain Government officials had been remiss in their duties in not having done it before. The officials attacked, being practical men, naturally have their critical faculty rather than their reason brought into play. They are more concerned to defend themselves than to admit their culpability by falling in with the views of the journalist. Such being their experience of journalism there is no wonder that the ordinary official thinks that most things are better kept out of the newspapers.

In the third place it is important to remember that the practical man's reason is not atrophied. It is latent and remains so, if he recognises that you are reasoning with him. He seems to resent being reasoned with. It is necessary to bring into play his latent reason ; but, if you try to do this by reasoning with him, you will arouse not his reason but his critical faculty. What is required is to begin by putting data before him with no show of reason on your part and then, if he sees that reason is necessary, he may supply his own.

In the following instance success in this was obtained by putting the data in such a way that the practical man with whom I had to deal probably regarded me as an extremely stupid person. The lack of reason appeared so glaring, that he made haste to supply it.

It is now generally known that if a microbe having the characters of the cholera microbe is detected in drinking water it is not wise to conclude that it is a microbe capable of producing cholera unless such a conclusion harmonises with the

results of a sanitary inspection. Many years ago, when this was not generally known, I found in the piped-water-supply of a certain town a microbe that responded to the tests for the cholera bacillus. Had this discovery been at once reported, it is probable that the authorities concerned would have thrown the piped supply out of use. The inhabitants would thereby have been reduced to using unprotected supplies and as some cases were then happening in the town in question, probably a severe outbreak of the disease would have resulted. It appeared to me improbable that any reasoning that was within my power would have appeared so cogent to the authorities as to persuade them to allow the public to continue to drink water containing a supposed cholera microbe. It therefore seemed preferable that the news should be broken to them gradually. After some delay, necessitated by my repeating the tests, I reported that the water contained "a vibrio that was agglutinated by anti-cholera serum." This cryptic utterance resulted in a telegram asking what it meant. My reply, sent not by telegram but by letter, was to the effect that some bacteriologists would be of opinion that a microbe having these characters was the cholera microbe. Owing to the delay in carrying out the test and the delay in receiving the explanation of my report, more than a week had elapsed between the date of collection of the sample of water and the time when the authorities knew that it contained what was probably the cholera microbe. There was nothing in my report or letter suggesting that I was trying to reason with them. On the contrary, the authorities were probably struck by the absence of reason on my part. They used their reasoning powers and came to the result that as everyone had been drinking the supposedly infected pipe water for a long time without getting infection therefrom, as I learnt afterwards was the case, the bacteriological test was of no importance. Hence the pipe water was not thrown out of use.\*

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\* The introduction of piped-water supplies has completely put an end to water-borne outbreaks of cholera in Indian towns.

Bismarck, when advocating the state purchase of railways, began with a careful avoidance of any show of reason on his part by comparing the monopoly that the railway companies enjoyed to the custom that had held in France before the revolution of farming out the revenue of the country to certain individuals. Such a comparison was not in itself reasoning, but it was a statement likely to arouse the reason of his audience and set them applying it to the question of the Prussian Railways. After making this comparison he went on to use reasoned arguments. For instance, he said the companies favoured the foreign producer, who will only bring his goods to them if favoured, at the expense of the home producer who must bring his goods to them whether he is favoured or not.\*

Another method of gaining assent is the Socratic method of asking questions. Indians, who are far superior to Englishmen in what perhaps may be called applied psychology, often put a statement in the form of a question. For example, an Indian gentleman while discussing a prominent official was heard to say :—"The Sahib has much politeness, but his true sympathy where is it ?† An example of an English diplomatist using a question in this way will be found at the end of the chapter, (1).

This difficulty in using reason as a means of communication does not only arise between experts and practical men. It also arises in communications between one business man and another. This is probably the explanation of the unwillingness of British manufacturers to introduce improvements demanded by their travelling representatives. The following incident, told me by an American business man, is a case in point.

A man, who said he was a commercial traveller in boots, once called at a boot shop somewhere in South Africa and

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\* *Modern Germany*, by J. Ellis Barker, 1909, p.p. 147 and 148.

† The speaker used the vernacular to this effect :—"Sahib-ke politeness bahut hai, lekin true sympathy kahan ?"



tried to sell his wares. The proprietor of the shop told him it was no use his applying. He used, he said, to deal with an English firm. But this firm obstinately refused to make boots of the particular pattern required for use in South Africa. He had shown what he wanted to a representative of the firm on several occasions, but with no result. He therefore had to import his boots from Germany. They were not of such good leather as the English boots and did not wear so well. But they had this advantage, that they included the little detail that was demanded by his clients. The visitor at length replied that he was one of the partners of the firm in question, that he had heard of the complaints and that he had come to South Africa to see into the matter for himself. Having now been convinced, he consented to make the necessary alteration and was able to renew his trade.

This seems a very expensive way of doing business. The firm first sent out a representative and then refused to be guided by his report. The representative, in writing home to his firm, necessarily used reason. The partners of the firm were accustomed to common sense and could not appreciate reason. It was unfamiliar to them. Perhaps it reminded them vaguely of the sort of "patter" used by the promoters of wildcat schemes who attempt to support by reason what is not amenable to common sense. Hence they disregarded their representative. They lost their business and only regained it when one of the partners went to South Africa and learnt at first hand what was wanted.

This firm would have found it a great deal cheaper to have had a representative who could have appealed to their common sense. Let us consider how this could be done.

In the scientific world the value of a man's opinion depends in a very large degree on the evidence he has in favour of it. In the official world the value of his opinion depends more on his position. In the business world it

depends chiefly on his salary. Business men, it may be suggested, would do well to pay their travelling representatives such high salaries as would attract a class of men whose opinions, dogmatically expressed, would carry weight without the help of reasoned argument.

The expert would be wrong if he regarded the advice given in this chapter as a universal panacea for all the difficulties he may meet with in dealing with practical men. Before applying the methods here described it is first necessary to be sure that the subject is one about which reasoning is advisable and that the reason that may be aroused is not likely to be so vitiated by prejudice as to be of no practical use. The expert can only hope to learn to distinguish such instances with the aid of experience.

#### NOTES

(1) As an example of a diplomatist employing questions to parry opposition to a request, the following story may be quoted. When Lord Beaconsfield arrived in Berlin for the Congress of the Powers in 1876, it became known to his staff that he intended to open the proceedings by a long speech in French. One of his private secretaries told the British Ambassador Lord Odo Russell of this, explaining that unless Lord Beaconsfield could be persuaded to speak in English he would make himself the laughing stock of the Congress. Lord Russell at once went to him to try to persuade him to use English instead of French. "My dear Lord," began Lord Odo, "a dreadful rumour has reached us." "Indeed, pray what is it?" "We have heard that you intend to open the proceedings tomorrow in French." "Well, Lord Odo, what of that?" "Why, of course, we all know there is no one in Europe more competent to do so than yourself. But then, after all, to make a French speech is a commonplace accomplishment. There will be at least half-a-dozen men at the Congress who could do it almost, if not quite, as well as

yourself. But on the other hand, who but you can make an English speech? All these Plenipotentiaries have come from the various courts of Europe expecting the greatest intellectual treat of their lives in hearing English spoken by its greatest living master. The question for you, my dear Lord, is 'will you disappoint them?' " Lord Beaconsfield put his glass in his eye, fixed his gaze on Lord Odo, and then said, "There is much force in what you say. I will consider the point." And next day he opened the proceedings in English. The anonymous author from whom this story is quoted suggests that Lord Beaconsfield saw through the flattery and recognised in Lord Russell's remarks a polite intimation that a French speech from him might not be suitable. But even if this supposition is correct, Lord Odo Russell's way of expressing himself is equally an example of the use of questions in arousing reason. This story will be found in a very charming book called "*Collections and Recollections, by one who has kept a Diary*," 1899, p. 256.

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## CHAPTER VI.

### THE PRACTICAL MAN AND THE EXPERT.

#### I. THE LAWYER.

The Expert Witness—The Expert Witness as a Judge of the value of his own Discovery—The Inexperienced Expert—Judgement Needed in Recognition—The System Obtaining in India—Edison on Patent Laws.

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IF an engineer when giving evidence is unduly optimistic as to the feasibility of a scheme in which he is interested, the lawyers are apt to dub him an "expert witness." This misuse of the term is one of the reasons why the public is never tired of quoting Lord Young's dictum about experts. I should be afraid to say how often I have been told as a joke that there are three grades of liars—the liar, the damned liar and the expert witness.

A scientist engaged in research is a man who is making a laborious and painstaking attempt to discover and record the truth. Any one who admits the accuracy of this description will regard it as strange if the scientist does not make a better witness than others. But the fact that in some cases he does not, must, I think, be admitted. The reason for this appears to be that he is the victim of a bad system. While in his laboratory his work makes little or no appeal to his emotions and therefore he lacks experience in protecting his reason from their effects. But when he has to obtain and give evidence in a law-court circumstances are such that he is exposed to various emotions, and these are liable to influence his judgement.

Supposing half-a-dozen men have to decide on some matter of fact; suppose one of these men has a magnifying glass which he uses to discover some additional evidence, then *ipso facto* he becomes an expert witness. But, under the system that exists in England, he is not only a witness, he becomes a judge, a judge of the value of his own discovery. His judge-

ment inevitably will be vitiated thereby. He will necessarily lay more weight than do others on that part of the problem in which he finds himself superior to his colleagues. It is an accepted legal principle, that a witness must not be an advocate nor an advocate a witness. It is even more important that an expert should not be a judge, in any sense of the word, in a matter in which he is a witness. In other words the expert who testifies to the discovery of a fact should not be asked to give an opinion on the value of his discovery. Another expert should be called in for this purpose. At the end of this chapter are recorded some incidents, from my own experience, that illustrate the danger of allowing an inexperienced man to make a discovery and also to give an opinion as to its value (1).

The man with the lens is under a further disability. He is working with colleagues who admire his skill, and who hope to be aided by it. They are likely to express pleasure if his discoveries help them and to show disappointment if the reverse is the case. Thus there is another appeal to his emotions. The desire to be useful to his employers is another recognised motive by which he may be influenced.\* The remedy would seem to be that the expert who is employed in discovering new facts should be engaged by the court rather than by the prosecution, and that he should be brought into personal contact with the counsel and investigating officers as little as possible. It should be clearly laid down that his business is not to procure a conviction but to discover facts, and that it is no concern of his whether the prisoner is acquitted or condemned.

Should the expert be inexperienced he suffers from another disability. A great part of his work consists of recognition. The kind of recognition required involves an act of

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\* Taylor, *Principles and Practice of Medical Jurisprudence*, 5th Ed., Vol. I, p. 45.

judgement. Unfortunately one's power of judgement does not seem to be at its best when the consciousness is dominated by strange and vivid sensory impressions. Reference has already been made, in a previous chapter, to the recognised fact that recently-acquired knowledge is not good for judgement. However it may come about, it is a fact that the inexperienced expert is apt to suffer from a singular lack of judgement if he has to use an apparatus to which he is unaccustomed. In his hands a microscope with an oil-immersion lens may be a most dangerous instrument. Some dirt scraped off a stain on clothing when seen under the microscope will show innumerable pieces of debris of every possible shape. There are no shadows. Everything is seen under brilliant illumination. There are no natural tints, for as a rule the specimen is stained to a brilliant colour by some aniline dye. In this world of strange objects the inexperienced expert, if he seeks long enough, is likely to find some piece of debris of the shape or nearly of the shape of the object for which he is looking. His judgement is required to say whether a true identification has been made. Unfortunately his judgement is apt to be curiously in default on such occasions and unable to curb his too vivid imagination. Hence it is that he will mistake a granular precipitate of the dye for any kind of microbe. A film of organic matter may have shrunk, leaving clear spaces. These I have known to be mistaken for a microbe of a particular kind. Cracks in a film of Canada balsam have been mistaken for some microbe never previously discovered. A crystal of ammonium chloride I have known to be mistaken for the very characteristic crystal of arsenious oxide. A crystal of permanganate may be mistaken for the very different crystal formed by mixing permanganate and cocaine. The only safe rule for the young expert is never to identify any microscopic object from a single specimen. If one hæmatin crystal, or whatever it is, is seen, if it is a real one, dozens of others are likely to be found. The only remedy for the

difficulty is to get experience. The young expert should remember that all through medico-legal work the best test is not the one the most recommended by others, but the test with which he is most familiar.

Care should be taken that experts required to do medico-legal work should only be asked to use methods or tests of which they have had experience. Owing to the advance of science it is now-a-days practically impossible for one man to be competent in all branches of medico-legal research. Different experts should be employed for the various branches of the subject and the authority who appoints them should know sufficient of the matter to be able to distinguish between one kind of expert and another.

The law courts in the United Provinces of Agra and Oudh, and, I believe, also those in other parts of India, have a noteworthy custom in cases of poisoning. The expert who tests for poisons is known as the "Chemical Examiner." He usually has to carry out tests in 700 to 1000 or even more cases of supposed poisoning per annum. Owing to the physical impossibility of his attending court in each of these cases, his written report is accepted as evidence. This report is merely on the facts he has discovered. It does not include any opinion as to the cause of death. Owing to representations made by me some years ago, this custom of the courts in the United Provinces of Agra and Oudh has been incorporated in the rules of procedure. The clause is as follows:—

"Magistrates should not address the Chemical Examiner on questions of a medico-legal nature. It is the Chemical Examiner's business to ascertain and report facts, and not to draw inferences. If a Magistrate wishes for expert assistance in the interpretation of the facts reported by the Chemical Examiner he should call the Civil Surgeon as a witness." \*

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\* *Manual of Government Orders, U. P.* Vol. I, Part VI. Judicial and Criminal Department, page 192, Section 873.

Anyone engaged in marshalling evidence is likely to lay undue weight on that portion of it that has been obtained by means of his own personal efforts. He is likely to give less weight to evidence from other sources and thus fail to arrive at a duly balanced judgement. Hence one would expect the custom of the Indian courts to be preferable to the custom that obtains in England, where one and the same expert testifies to his discovery of a fact and also gives his opinion as to the value of his discovery.

The present Indian system has another advantage. The Chemical Examiner does not, as a rule, go to court. He knows very little about the case and never, unless by accident, hears of the verdict. There is no appeal to his sympathy. He has no interest or bias in the case as would inevitably occur if he came in contact with police officers or counsel, who would regard his evidence as good if it promised to lead to a conviction, and who perhaps might not conceal their disappointment if the reverse was the case.

There is a story told of a lawyer who when cross-examining an expert suddenly said to him, "By the way, Mr. Blank, can you tell me the test for soot?" The expert was visibly confused by this unexpected question, and his confusion apparently led the jury to lay less weight on his evidence than they otherwise would have done. One may well ask whether it is worth while to bring an expert to court to play tricks on him of this kind? It may be suggested that it would be undesirable to do so if he merely had to testify to facts he had discovered.

The above criticisms will not apply to the method adopted in Great Britain in certain cases in which expert *opinion* is required as distinguished from evidence of facts discovered by expert methods. I quote the following account of the practice of the Admiralty Court from Taylor's *Medical Jurisprudence*.\*

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\* 5th Ed., Vol. I, p. 53



"Four masters of the Trinity House, experienced in all the rules of navigation, give their opinions on questions submitted to them as nautical experts, by the court; and without creating any charge of injustice in the decisions of the court, they constantly guide these decisions in answering certain difficult nautical questions. In a case in which two ships come into collision, both parties contend they are right, or the case would not be litigated. The question turns upon the respective position of the ships, the setting of certain sails, the direction of winds, tide, and currents, and whether the helm should have been ported or starboarded before the collision. These nautical experts acquit themselves with satisfaction; they are not put into the witness-box by the parties to the suit, but are placed on the Bench and act with judicial responsibility."

It may be noted that were these nautical assessors put into the witness-box they would be asked to base their opinions on the definite facts of their experience that they could remember. In replies to counsel they would be asked to give reasoned opinions. So long as they are on the bench they can base their opinions on common sense, on something else, that is to say, than merely definitely remembered facts of experience.

Edison seems to desire a somewhat similar procedure in respect of patent laws. He says:—"It seems to me that scientific disputes should be decided by some court containing at least one or two scientific men capable of comprehending the significance of an invention and the difficulties of its accomplishment, if justice is ever to be given to an inventor. And I think also that this court should have the power to summon before it and examine any recognised expert in the special art, who might be able to testify to *facts* for or against the patent, instead of trying to gather the truth from the tedious essays of

hired experts whose depositions are really nothing but sworn arguments."\*

It should be remembered that an expert is not an ordinary person. He is a highly specialised product. To say that he is highly specialised is much the same as saying he is unadaptable. The proverb, "Let the cobbler stick to his last," represents public opinion of a certain kind of expert, and, I venture to think, is applicable to all of them. Hence it is desirable that for legal purposes there should be two kinds of experts, one the discoverer who testifies to facts he discovers or knows, and the other, who should be a man of long experience, who gives an opinion on the value of such discoveries. The advisability of employing these two kinds of experts in commercial affairs will be referred to in the following chapter.

#### NOTES.

(1) a. In a murder case which the police regarded as of some importance a local doctor was asked whether certain stains on a coat were of blood. He reported that he thought they were. In his hands it was true they had refused to respond to the tests for blood, but he still thought they were bloodstains; and he expected that, if they were sent to the Chemical Examiner, that officer by applying other and better tests would be able to furnish the required proof. The coat was sent to me. It was covered with prominent stains which, had they been of blood, would presumably have responded to the tests very strongly. No blood was detected. In this instance the inexperienced observer, owing to his desire to give useful evidence, showed most unjustifiable scepticism in interpreting his results.

(1) b. In another case the accused admitted that he had mixed powdered blister-beetle (*Cantharidis*) with someone's food with criminal intent. A young medical man who

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\*Dyer and Martin, loc. cit., p. 187.

was consulted by the police managed to find in the food a piece of material on which was a projection that he recognised as a spine. As some insects have spines this was held to justify the identification as a piece of a *cantharidis* beetle. I reported that the material had no characters that would lead one to believe that it was part of any insect whatever.

(1) c. In a case of supposed croton-seed poisoning a piece of solid substance that had been found in soup was sent to me for examination. It was found that it had the microscopical and chemical characters of a piece of meat and also that it tasted like meat. It had none of the very distinctive characters of vegetable tissue. Nevertheless it had been identified as a piece of croton seed by the medical man who had been called in to treat the patient and whose sympathies, we may suppose, had been aroused with a bad effect on his judgment.

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## CHAPTER VII.

### THE PRACTICAL MAN AND THE EXPERT

#### II. THE BUSINESS MAN.

Experts as Directors of Commercial Companies—Reasons why they should be Consulting Experts Rather than Directors—Example of Lord Kelvin—Business men Needing Expert Help in Dealing with Inventors—Need of Two Kinds of Experts.

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MR. J. M. ROBERTSON, the Parliamentary Secretary to the Board of Trade, said, in the House of Commons on the 11th March, 1915, that he knew of many chemical concerns which had been ruined by having highly gifted scientific men on their boards. This statement raises the question whether the scientist is in his right position on the board of a commercial company. The story of Lord Kelvin's connection with commercial companies will be found to furnish evidence bearing on this point.

Lord Kelvin (he was then Professor Thomson) was one of the directors of the first company for laying a cable across the Atlantic. Mr. Whitehouse, a retired medical man, and in electrical matters little better than a quack, was appointed electrician to the company. The consequences of this arrangement were disastrous. The directors being business men naturally were guided by their electrician who spoke to them with authority because of his official post. Lord Kelvin spoke to them with no such authority but with reason. What the company wanted from Lord Kelvin was not his reasoning or his reasons. They wanted his conclusions. Had he been a consulting expert to the company the directors would have considered his conclusions rather than his arguments, and it is probable that the weight laid on his conclusions would have been in proportion to his fee.

The actual history of this cable was as follows :—The

cable was laid. A few messages were sent through it with difficulty and then after a few days it ceased to work. Too late the directors discovered that the cable had been ruined by the strong currents that had been employed by their electrician against the advice of Lord Kelvin.

The directors dismissed Mr. Whitehouse, and Lord Kelvin "with an excess of generosity asked the Board to condone Whitehouse's errors of judgement." This request illustrates another inconvenience of Lord Kelvin's being a director. Because he was a director, his natural generosity tended to make him lenient towards a subordinate. Had Lord Kelvin been in an independent position, as a consulting expert, it is probable that he would have confined himself to criticising the electrical work of Mr. Whitehouse. The other directors evidently thought that Lord Kelvin's advice on this business matter, the retention of an incompetent subordinate, was bad. In their reply to Lord Kelvin, they expressed themselves as follows:—

"Mr. Whitehouse has been engaged some 18 months in investigations, which have cost some £12,000 to this company, so that he has been in a position to avail himself of every resource that would tend to accomplish the objects on which he was at work, and now when we have laid our cable and the whole world is looking on with impatience to realise some results from our success, we are, after all, only saved from being a laughing stock because the Directors are fortunate enough to have an illustrious colleague who had devoted his mind to this subject, and whose inventions produced *in his own study at small expense*—and from his own *resources* are available to supercede the useless portions of apparatus prepared at great labour and enormous cost for this special occasion."

This was in 1858. Some years later, in 1865, the project was revived. Lord Kelvin was again employed by the company, but this time as a consulting expert. The directors listened to his advice, used his transmitting and receiving instruments, and

the cable was a success. With later cable companies Lord Kelvin was also in his proper position as consulting electrician and not as a director, so far as can be gathered from his biography.\*

In considering the question whether experts should follow Lord Kelvin's example and become consulting experts to commercial companies, or whether, on the other hand, they should become directors, it is well to remember that a business man is likely to give more weight to a conclusion for which he has paid than he will to a long reasoned argument that he is incapable of appreciating. Further, a business man is accustomed to arrive at decisions by acts of his subconscious judgement for which he is unable to give reasons that would satisfy his expert colleague. The latter's reasoning power will often connote a capacity for talking against which the business man may be helpless and by which he may be convinced "against his better judgement," or, if this does not happen, by which valuable time may be wasted. All these considerations indicate that the expert is out of place on the board of a commercial company. *A propos* of a discussion as to the governing of London University, Professor Huxley wrote :—"As for a government by professors only, the fact of their being specialists is against them. Most of them are broad-minded, practical men; some are good administrators. But, unfortunately, there is among them, as in other professions, a fair sprinkling of one-idea'd fanatics, ignorant of the commonest conventions of official relation, and content with nothing if they cannot get everything their own way. It is these persons who, with the very highest and purest intentions, would ruin any administrative body unless they were counterpoised by non-professional, common-sense members of recognised weight and authority in the conduct of affairs." (*Life and Letters of Thomas Henry*

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\* See "*Life of Lord Kelvin*" by Sylvanus P. Thompson, pp. 330, 331, 339, 350, 370, 374, 483 and 552.

*Huxley*, by Leonard Huxley, Macmillan & Co., 1908, Vol. III, page 233). Thus, in Professor Huxley's opinion, the "one idea'd fanatics" could be better counterpoised by "common-sense members" than by professors. It may be surmised that common-sense members would be less ready than the professors to listen to the reason on which the fanatics would inevitably depend.

Experts do not always realise what is wanted in a commercial affair. A speaker in a discussion on industrial chemists, in 1917, stated that "the commercial training of the chemist was a very difficult subject, because there was the jealousy of the commercial man to deal with. The average commercial man learnt by association with the firm and learnt very easily indeed. The wonderful principles of finance were very simple, and any man with a chemical training would easily learn them."

This dictum seems to imply the very questionable belief that there is nothing in a man's head beyond a knowledge of facts. It may be doubted whether a chemist who has learnt the principles of finance would thereby have developed the business instinct. Chemistry is a subject that can be "learnt" to a great extent by remembering chemical facts. There is no evidence that the "business instinct" is a thing that can be learnt in the same way. On the contrary cases have been quoted that show that it is a mental quality that "develops," and that it develops best in people who have a most surprising power of forgetting, or who have had but little opportunity of learning.

The critic may also be wrong in speaking of the "jealousy" of the commercial man. This appearance of jealousy may be the result of the business man's incapacity for giving reasons for his common-sense decisions that would satisfy the logical mind of the expert.

The business instinct and the power of scientific reasoning are so opposed to each other in mental method, and so

generally found in separate heads, that it is reasonable to suspect that the development of one tends to hinder the development of the other.

The above considerations probably apply justly to instances where it is desired to make a continued application of some scientific discovery. But there is room for doubt as to how far they apply in branches of manufacture where there is continuous progress owing to fresh scientific discoveries. In the making of aniline dyes, for instance, not only are new dyes being discovered, but the users of the dyes have sometimes to be educated in their use. Whether a new dye should be made or an existing dye dropped will depend on many factors whose value can only be appreciated by experts; for instance, it will depend not only on the availability of new raw materials but also on the possibility of utilising bye-products in other branches of the factory, etc.

It is usual for men of scientific training to be on the boards of German dye manufacturing companies. But the chemist who finds himself on the board of such a company is a commercial chemist who has been selected from a large number of commercial chemists and who has had many years experience of commercial work.

An account of the method of producing a German commercial chemist has been given by Dr. M. O. Forster, F.R.S.\* He says that it is amply proved by experience at the large German chemical factories that much time is required to discover a man's capacities, that "although ample promise may be given at the age of 30, full development is not usually reached before 40, and in many cases even later. If then a factory staff of 50 chemists recruited at 22 or thereabouts be allowed to develop under the influence of factory surroundings and requirements, there will prevail throughout the organisa-

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\* *Journal of the Society of Chemical Industry*, 31st July, 1915, Vol. XXXIV, p. 760.



tion an interchange of thought and outlook contributing to the highest degree of chemical development along the lines of individual temperament. The legal-minded man will gravitate towards the factory patent office, the bookworm, towards the library. The skilful analyst will become the indispensable and time-saving support of the discoverer who will ransack raw and waste materials assisted by the man who has found his calling to be preparation.....The whole point is that at 22, one is only dimly conscious of being either legal-minded, a bookworm, an analyst, a discoverer, a preparator, a mechanician, or a human person, and that given the necessary chemical rudiments, a plunge into the above mentioned system is the best way for a young chemist to classify himself." This system of education is not entirely satisfactory. Under the strain of war German chemists appear to have been wanting in initiative and adaptability.\* Facts can be quoted that show that the success of German chemical concerns is more due to their having good things to sell than to the possession of real business capacity. †

It will be of interest to compare the education of candidates for the Indian Civil Service with that of the German commercial chemist. The German chemist according to the above quoted description imperceptibly gravitates towards the particular branch of the work for which he finds himself best fitted. The process of education seems to be a process finding out what he likes best and giving him opportunities of doing it.

The method of education of the Indian civilian is entirely different. ‡ It would not be different from what it is had its object been to exclude anyone having the expert turn of mind. The large number of subjects in the entrance examination, and

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\* See Sir William Pope's presidential address to the Chemical Society for 1919, *Journal of the Chemical Society*, April 1919, page 402.

† See *German business methods in the United States* by Mr. H. C. Burr, in the *Quarterly Review*, July 1919, page 16.

‡ "Civilian" is the term usually employed in India to designate members of the Covenanted Civil Service.

the high proficiency required in each, effectually prevent the candidate from being specially interested in any one of them. Because he is uninterested he forgets what he learns, as I have shown elsewhere. His power of forgetting consequently is not damaged and hence he has the power of making rapid instinctive decisions. He acquires a habit of going through life without acquiring any special interests. A young Indian civilian, if you ask him, is likely to tell you that his work is very monotonous and mostly dull routine. But what he does not tell you, and does not realise, is, that if he is ordered off to an entirely different job, at a moment's notice, he will find it equally uninteresting, but he may be relied on to do it equally well. Under the surface young Indian civilians are as much alike as a row of peas in a pod, a proof that their character has been influenced by their education. They don't talk much. They don't write much. Perhaps they don't think much. Their speciality is doing things. It may be said that they are machines for doing the right thing at the right time. The chief characteristics of the young Indian civilian are reliability and adaptability. An English professor of chemistry at an Indian University once lamented to me that "these Indian civilians expect us to be able to turn our hands to anything just as they can themselves." An expert can turn to another subject in which he is interested, but he is not likely to do well in a subject in which he is uninterested. The adaptability of the Indian civilian is probably connected with his freedom from any special interest. The lack of interest is also of value to him in that it makes for impartiality. The want of interest has the disadvantage that it results in his wanting what may be called the "journalistic instinct." He is unable to express things in a way that will interest other people, and hence he often does not get as much credit as he deserves for his administrative ability. The many flattering opinions I have heard as to the ability of the Indian civilian relate for

the most part to his work as a district officer. On the other hand, as they themselves admit, civilians are handicapped by their lack of scientific training when dealing with scientific or technical affairs.

An occasion on which the business man requires the help of reason rather than of common sense is when he is dealing with new inventions. Supposing an inventor comes to a business man with proposals for a new process or method of manufacture and invites the business man to finance the undertaking, then there can be no doubt that in such an eventuality the use of reason is demanded. The only matter where common sense is required is in deciding whose reason? Not the inventor's for he will certainly be prejudiced in favour of his invention. Not the reason of the business man himself for, so far as the technical details of the matter are concerned, he will probably lack the necessary expert knowledge. What is wanted is for the business man to get independent advice from an expert. Not every expert is suitable. He must get an expert who is accustomed to give decisions as to the value of other people's inventions. If he gets hold of an expert who lacks such experience, he may get something of the nature of carping criticism instead of reasoned judgement. Several such instances are known to me. For instance, I once suggested that a certain research might lead to important results. The idea was submitted to an expert in the subject who simply pulverised my suggestion. I afterwards found that this expert, in a book he had written, had himself advocated the very same idea that he now criticised so violently. He had forgotten what he had written and his view that I was an ill-informed interloper on his preserves perhaps influenced his judgement.

In Germany the inventor of a new process does not find it necessary to persuade a business man to promote a company to develop his invention. He applies to one of the banks that undertake this kind of work. The bank keeps a staff of experts

who investigate the whole subject. Not only are there experts for the scientific or technical aspects of the matter, but also there are other experts who report on such subjects as the supply of raw materials, and the probable demand. No attractive prospectus is issued. No exaggerated statements are made to influence an unwilling public. No expenses are incurred in promoting a company or underwriting its shares. If the bank is satisfied with the reports of its experts, the bank itself advances the money. It was in this way that capital was obtained for the first manufactories for the fixation of atmospheric nitrogen, a matter of the greatest commercial importance. Had it not been for this industry, Germany would have run short of explosives at a very early stage of the war.

Thus, in commercial matters as in law, there is a need for two kinds of experts: one whose qualifications should be skill and originality for making discoveries; the other, for whom age and experience are more important than originality, whose business should be to give a judicial opinion on the value of inventions or processes submitted for his consideration. In a later chapter examples will be described of men of business falling victims to swindlers simply because in scientific matters they preferred to trust their own reason rather than the reason of an independent expert.

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## CHAPTER VIII.

### EXPERTS AS BUSINESS MEN.

Lack of Business Capacity in Inventors—Lord Kelvin's Success in Exploiting his Inventions—his Partnership with Engineers—Agassiz, Edison and other Experts Successful in Business.

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AN expert who makes a discovery that is of value to humanity is far more likely to have a statue erected to him after his death than to receive an adequate reward during his life.

This state of affairs is partly due to popular dislike of innovations, partly to the disinterestedness of the expert, partly to the conditions under which he works, but partly, it may be suspected, to the expert's lack of the business instinct.

Many instances may be quoted of discoverers and inventors who have tried to make money but who have failed owing to their lack of business ability. These men, though not in the correct sense of the word experts, have resembled experts in having more reasoning powers and imagination than their fellows. The following will serve as instances.

Thomas Waghorn was the hero of the movement for the establishment of lines of steamers plying by way of the Mediterranean and Red Sea for shortening the voyage from England to India—the so-called "Overland Route." Owing to his efforts a private mail service was established along this route in 1834. Though he had reason to complain of lack of official help at first, at length, in 1838, his steamers were taken over by Government and he was employed by them to supervise the mails. But he died in 1850, "A broken-hearted pauper, who was believed by an incredulous world to be the victim of an amiable craze." \*

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\* An article in the *Pioneer* of the 29th October, 1917, entitled "The English Mail in the Days of the Company."

Captain Wiggins was a seaman who devoted years of his life between 1874 and 1896 in trying to open a trade route between England and Siberia via the North of Norway. He showed lack of business instinct in that his means were disproportionate to his ambitions, and he failed for this reason, and also because he fell foul of some vested interests which he was unable to foresee or to overcome.\*

There is a certain machine widely used in England and of sufficient importance to have a weekly journal devoted to it. A certain engineer has the reputation of being the cleverest designer of these machines in England. His reasoning power and imagination are therefore above the average. Nevertheless, owing to his lack of business instinct he has been bankrupt twice and, it is said, is likely to be bankrupt again.

Lord Kelvin is known to have made a great deal of money by his inventions. But on reading his life it is clear that he only was successful in this respect when he was in partnership with practical men. For example, as regards his patents, he was in partnership with Varley, an electrician, and Fleeming Jenkin an engineer. The story of the best known of his patents is as follows :—

When the first Atlantic cable was laid, it was found that for some abstruse reasons, whose nature was discovered by Lord Kelvin, extremely feeble currents of electricity had to be employed. At first, the only way of detecting these currents was by means of Lord Kelvin's "mirror galvanometer." The current from the cable was passed into the instrument and caused oscillations of a small magnet. A minute mirror was attached to the magnet and served to reflect a beam of light on to a screen. The movements of the spot of light thus produced represented telegraphic signals which could be interpreted by a skilled observer. The spot of light had to be watched

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\* "*Life and Voyages of Joseph Wiggins*," by Henry Johnson (John Murray, London, 1907).

constantly day and night, a duty that was intolerably fatiguing. Such was the sensitiveness of the instrument that the spot of light was easily deflected by a current received through the whole length of the cable from a battery made of a lady's thimble, a small piece of zinc, and a few drops of dilute acid. It would seem an insoluble problem to get sufficient power out of the feeble currents that came through the cable to move a pen which could write down the signals on a moving ribbon of paper. But this problem Lord Kelvin solved with his marvellously ingenious instrument, known as the "siphon recorder." Its use by the companies was inevitable. Very wisely he did not tell them of this discovery until they had agreed to pay royalty on his previous instrument the mirror galvanometer. As soon as this was arranged he brought out the siphon recorder and charged the companies £1,000 a year for permission to use it. Thenceforward every company that laid down a cable had to pay Lord Kelvin £1,000 a year for using his instrument.

From the point of view of business Lord Kelvin had a very easy furrow to hoe. Business acumen was required, not by Lord Kelvin, but rather by the promoters of the companies who had to calculate whether the traffic would indemnify them for the expense incurred in paying royalties and laying the cables.

It is recorded that Lord Kelvin and several of his friends in 1881 spent some time in attempting to start a company to exploit the Faure accumulator. The agent of the French patentees is said to have had a marvellous genius for drafting prospectuses. "The negotiations lasted through August, as one by one withdrew from taking part in so formidable a venture; but it was not till some weeks later that Sir William (afterwards Lord Kelvin) was brought to realize the very unsatisfactory position; and he too withdrew—a heavy loser by the affair—from all association with the venture, though he wished the invention success." \*

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\* *Life of Lord Kelvin*, by Silvanus P. Thompson, (Macmillan and Co., 1910), pp. 575, 623, 650, and 770.

The friends of Lord Kelvin showed the business instinct in withdrawing from the affair in time. The same can not be said of Lord Kelvin.

Of the instances known to me of experts who have shown business or administrative ability, there is not one in which the expert began his adult life with an expert's education or bent of mind. In every case there was first some opportunity for the development of the instinctive powers of the mind and only after this had occurred was scientific ability manifest. The importance of this fact lies in its bearing on questions relating to the education of the expert.

The story told of the younger Agassiz is that he wished to follow in his father's footsteps and devote his life to zoology. To be able to do so, money was necessary. He resolved to make it. His life history was as follows: He took his degree at Harvard in 1855, and afterwards studied engineering and chemistry. Then he became an assistant in the United States Coast Survey. His next move was to become Superintendent of the Calumet and Hecla Copper Mine. This mine did not conform to the classical description in being a hole in the ground with a fool at the bottom and a knave at the top, as it turned out to be a considerable source of profit. It was only after he made his money in this way that Agassiz developed into an expert in zoological subjects.

Edison has made a great deal of money by his discoveries. He cannot, however, be described as a typical expert. He lacked the ordinary education of an expert. As a child he was "rather wanting in ordinary acumen" but was highly inquisitive and had an extraordinarily retentive memory. He had three months schooling only, and afterwards was taught by his mother who was well-informed and ambitious. He early showed a taste for experiment, for doing things rather than learning things. For instance, as a boy he made a telegraph and tried to get electricity for it by rubbing a cat. He seems



always to have been inspired by a desire for results or for profit rather than by a desire for knowledge. After some of his discoveries had made him famous he got an opportunity of experimenting with 2,000 miles of telegraph cable coiled up in a tank. He says about this :—"I sent a single dot, which should have been recorded upon my automatic paper by a mark about one thirty-second of an inch long. Instead of that it was twenty-seven feet long. If ever I had any conceit it vanished from my boots up. What I did not know at the time was that a coiled cable, owing to induction, was infinitely worse than when laid out straight." It is remarkable that a man who had discovered quadruplex telegraphy did not know a fact of this nature. His commercial instinct was not incompatible with scientific acumen. In reference to his cement works he said, "The only way to keep ahead of the procession is to experiment. If you don't the other fellow will. When there's no experimenting there's no progress. Stop experimenting and you go backward."

Benjamin Franklin (1706-1790) the American diplomatist and scientist had only two years of school life. At the age of 10 he was apprenticed to a tallow-chandler. Later he became a printer. In 1737, at the age of 31, he published a paper on the causes of earthquakes. In 1749 he discovered the lightning conductor. He carried out his celebrated experiment of getting electricity from a kite-string in 1752. By thus proving that thunder and lightning were due to natural causes he dealt a blow against the then prevalent belief that storms were due to witchcraft and thus indirectly helped to put a stop to the persecution of witches.

Count Rumford (1753-1814) an American, was apprenticed to a store-keeper at the age of 13. In his spare time he carried out chemical and mechanical experiments. He was precocious in mathematics. At the age of 14 he calculated a solar eclipse within four seconds of accuracy. He became an

administrator and only at a later date showed scientific originality. He published his discovery that heat is a mode of motion in 1798.

Sir Joseph Whitworth (1813-1887), the engineer, well-known for his work in introducing accurate methods into the machine shop, left school at the age of 14. He then became a cotton-spinner and at 18 worked under a machine-manufacturer. In 1840 he published his first scientific paper dealing with true planes.

Sir Henry Bessemer (1813-1898) was the discoverer of an improved method of making steel. After completing his education he started a steel-works. He discovered his improved methods of manufacture in 1856.

Sir William Armstrong (1810-1900), the engineer, was a solicitor from 1833-1847. In 1841 he published a paper on electricity produced by effluent steam.

Sir Andrew Noble (1832-1915), an expert on explosives, entered the Royal Artillery in 1849. In 1855 he reached the rank of Captain. In 1857 he became secretary of the Royal Artillery Institution. In 1859 he joined the Elswick works.

The first Lord Avebury (1832-1913) was sent to Eton in 1845. In 1848 he joined his father's bank. In 1856 he became partner. After this he showed scientific originality. In 1865 he published his book on "*Prehistoric Times*," in 1870 a book on "*The Origin of Civilization*," and in 1873 another on the "*Origin and Metamorphosis of Insects*."

His father, Sir John William Lubbock, was a banker who published papers dealing with mathematical subjects.

Thus available evidence tends to show that if a man's subconscious judgement is first properly developed he may afterwards acquire scientific ability, but that if he begins his adult life with his mind well-stocked with scientific knowledge he will never afterwards become distinguished for administrative power or business instinct. The late Mr. Pierpont

Morgan, the American banker, once said, "I can hire any expert for 250 dollars and make 250 thousand dollars with the information he gives me, but he can't make the money himself and he can't hire me to do it for him." This dictum seems to sum up accurately the limitations in business capacity of the average expert.

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## CHAPTER IX.

### BUSINESS MEN AS EXPERTS.

Business Men Acting as Experts and Being Deceived by Charlatans Masquerading as Experts—Explanation to be Found by Study of Confidence Tricks—Examples—Desire for Gain Upsetting the Business Man's Judgement—Experts Deceived by Spiritualists—Opposition to New Discoveries.

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"A LADY palmist and astrologer is willing to accord interviews to business men and speculators." So runs an advertisement in my daily paper. The question arises why is it that hard-headed business men, who are apt to be impervious to reason propounded to them by an expert, are liable to succumb to reason when offered to them by a lady astrologer? It is a fact that experts who have made valuable discoveries have the greatest difficulty in finding capital in England to develop their inventions. On the other hand one not infrequently hears of instances in which persons who are not experts, but who pretend to be experts, succeed in getting the better of business men. Some time ago one of these bogus experts persuaded some business men that he could manufacture diamonds. These business men, instead of calling in expert advice, themselves tried to judge the value of the invention and for some time were taken in by diamonds that had been introduced into the apparatus by sleight of hand.

Sir Robert Anderson tells a story of a London house "whose name is in high repute in all the capitals of Europe" being taken in by a swindler who professed to have the power of increasing gold. Whatever amount of gold was given to him, he had, he said, the power of doubling its quantity. The firm, instead of getting an independent expert to investigate the matter, thought that they themselves were capable of estimating the value of a scientific experiment, and offered the swindler £100 for the purpose. He declined this paltry sum

as entailing mere waste of time. At length the firm put up £20,000 and took a house in Lemon Street, Whitechapel, for the experiment. His conditions were (1) that no one else should be allowed to enter the laboratory, (2) that he should be rigorously searched every time he went out. He happened to have a gold-headed walking-stick. The members of the firm, who were greedy of gold, respected this walking-stick. This was unfortunate for them as it was hollow. The swindler used the hollow of his walking-stick to remove the sovereigns. When they had all been abstracted in this way he wrote to the firm explaining what he had done and daring them to report the matter to the police.\*

To understand how business men, men of common sense, can be deceived by such methods we shall find some help in studying various forms of the confidence trick. Let me quote some examples.

A stranger in Bombay, who may be referred to as the dupe, while walking in the street, happened to make the acquaintance of a man who may be described Villain No. 1. They went into a restaurant together and called for coffee. Presently Villain No. 1 pointed out a man sitting at the other side of the room, who he said was a remarkable magician. By his incantations he could kill a man at a distance. The magician was Villain No. 2. No. 1 had scarcely finished his description when an acquaintance (No. 3) arrived and sat down by them. They changed the subject and began to talk of trivial matters. Suddenly No. 3 saw walking at the opposite side of the road a man whom he described to them as being a rich Mohammedan merchant that he knew slightly. This was Villain No. 4. This merchant, said No. 3, had recently had a quarrel with a man named Allah Buksh. Such was his anger and enmity that he was ready to pay a reward of five

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\* "*The Lighter Side of my Official Life*" by Sir Robert Anderson, (Hodder and Stoughton, London, 1910.)

thousand rupees to anybody who would kill Allah Buksh. Villain No. 1 at once winked to the dupe, and hastily taking leave of No. 3, the two left the restaurant together. "Here is a chance," said he to the dupe, "of our making our fortunes. Let us introduce ourselves to the merchant, make terms with him, and then bring the magician to his house." The dupe consented. They were hurrying along the road and the dupe had no time to think. They spoke to the merchant, then fetched the magician and repaired together to the merchant's house. The incantations were duly performed and then No. 1 and the dupe went out for a walk, probably to find out whether anything had happened to Allah Buksh. Presently they met a stranger who was crying bitterly. They stopped to ask him the cause of his grief. He replied that his dearest friend Allah Buksh was walking along the street a few minutes ago apparently in the best of health when suddenly he staggered and fell down dead. After expressing sympathy with the stranger (Villain No. 5) they returned to the house of the supposed merchant with what the dupe regarded as perfectly independent evidence of the success of the incantations. They began to claim the reward when suddenly the magician was seized with a very alarming fit. No. 1 explained to the dupe and the merchant that the magician was liable to such seizures after performing his magical rites and that the only remedy was to wait till he was a little better and then to take him to the Jain temple at the end of Abdur Rahman Street. The magician soon showed signs of recovery and they went out together. Unfortunately, when on the way to the temple, they were arrested by a policeman on a charge of murder of a man named Allah Buksh. The dupe thus received a further proof of the efficacy of the incantations. While on their way to the police station, No. 1 suggested to the dupe that, as their guilt was so clearly evident, their only chance was to bribe the policeman to let them go. There was no great

difficulty in doing this as the policeman was Villain No. 6. The dupe gave up all the money in his possession. As soon as they were free the villain pointed out that they were still liable to arrest and they must fly. This they did, leaving the dupe slowly to wake from his dream of wealth and to realise that he had been cheated.

The use of photography in the bogus forging of currency notes is, I believe, a practical application of science peculiar to India. The stock-in-trade of a professor of this art was once sent to me for examination. A number of bottles of essences and coloured pigments and packets of powders were contained in a box about ten inches long, six inches wide and about six inches deep. Each of the edges of the box was strengthened with a few short strips of sheet brass. On raising the lid a small shelf about an inch wide was found running along the length of the top of the box on the side nearest the hinges. The purpose of the shelf was to conceal a false bottom. This false bottom normally was kept standing up against the rear side of the box. It was held in position by a catch. On pressing one of the brass strips on the outside of the box the catch released the false bottom, allowing it to fall down and hide the true bottom of the box. The modus operandi was as follows:

The swindler represents to the dupe that he has the power of duplicating currency notes. The bottles and powders are merely for show. The swindler takes a ten rupee currency note, places it on a piece of photographic sensitive paper and covers it with a sheet of glass. It is exposed for a few minutes to the sun. On raising the glass an impression of the currency note is found on the sensitive paper. The swindler then asks the dupe to look into the box and see that it is empty. The inside of the box is painted black, the better to conceal the arrangements for the false bottom. The dupe being convinced that there is nothing in the box is asked to put into it the half-

made currency note. This he does and closes the lid. The swindler performs his incantations. He, then, taking care to point out that he has not touched the note at all, picks up the box, and in so doing presses the secret spring. The false bottom falls down, conceals the half-made note and liberates a real currency note that had been concealed behind it. He hands the box to the dupe and asks him to open it. The dupe takes out the real currency note. Without giving him time to think, the swindler sends the dupe off to the bazar to buy some tobacco and to change the note so as to get an independent proof that the note is real. This he does and comes back with the change. The swindler then offers as a favour, to duplicate a note for a thousand rupees. The dupe produces a thousand rupee note. This time the procedure is different. The photographic impression is made as before and the swindler pretends to tie this up in a parcel with the real currency note. But he abstracts the latter by sleight of hand. The parcel is buried in the ground. The swindler performs his incantations and orders that the parcel should only be dug up after an interval of three days as otherwise the magic will not work. The swindler then departs having a three days' start. Probably he has a longer start for, after the dupe discovers he has been cheated, he is likely to hesitate a little before admitting to the police that he was concerned in an attempted forgery of currency notes.

When the anarchist agitation began in India some years ago, a gang of swindlers made use of it in a very unexpected way. They arrived at Delhi and began buying up all the copper coins of a particular issue. I think it was that of the year 1906. The price began to go up. Soon they were giving three or four annas for a half-anna coin. Much interest was aroused. Everyone was trying to find out why these coins were wanted. At last when the price had risen to 7 or 8 annas one of the confederates did divulge the secret under the strict-



est seal of confidence. The anarchists in Calcutta, he said, wishing to embarrass the Government, had got into the Mint one night and dropped some plates of gold they found there into a pot of melted copper. It was from this copper that the 1906 issue of copper coins had been made. Each coin was worth therefore several rupees. Gradually the secret got out. Some strangers arrived, who were confederates, and who had a large supply of these coins. Everybody was buying them right and left and the price rose to between 15 and 20 annas. The original buyers who had bought at 3 or 4 annas now quietly sold out at the higher rate. They then vanished and the half-anna coin somewhat rapidly returned to its normal rate of exchange.

A clue to the psychological basis of these tricks is yielded by an old Thug story. This case is of interest because two failures preceded the success. A nawab who had a great reputation for personal courage was travelling through a district infested by Thugs. A party of these robbers resolved to murder him. Knowing his route they went on in front and allowed the nawab to overtake some of their party. They pretended to be a set of poor people and implored his protection. The nawab was suspicious and drove them away. Making a detour they again got in front and were overtaken by the nawab three days later. This time they were disguised as rich Hindu merchants. They told the nawab that they had much money with them and would willingly pay for his protection. Again the nawab was suspicious and refused to travel in their company. Again they went on ahead. This time when the nawab overtook them he found them disguised as Mohammedan soldiers. One was lying on the ground wrapped in a sheet. A grave was dug beside the supposed body. They told the nawab that one of their comrades had died. They were burying him, but being too ignorant to offer up prayers in accordance with custom, they implored his help.

The grief of those poor ignorant soldiers and their desire to perform the last rites for their dead comrade aroused the pity of the nawab. He dismounted, put down his weapons, and knelt in prayer. At once the strangling cloth was round his neck. In a few moments he was dead; then his valuables were stolen and he was rapidly buried in the grave that had already been prepared.

The point of importance in this story is that the nawab only lost his caution when his emotions were aroused.

This is the psychological basis of the confidence trick. The swindler vitiates the judgement of his dupe by playing on his desires or emotions. The desire for gain is the one most generally used. No doubt the desire for gain underlies every commercial transaction, but it is not usually so stimulated as to vitiate the common sense of the business man. But in each of these tricks the dupe was offered the prospect of unusually large gain with unusually little trouble. The desire for gain was thereby unduly stimulated, and when this happened caution vanished. Other sentiments also may be called into action; the fear of being found out, the fear of seeming timid in the classical English confidence trick, one's natural desire to help a stranger, or one's feeling of comradeship, may all be used by the specialist in confidence tricks to influence the judgement of the dupe.

We may now revert to the question why business men refuse genuine opportunities of making money propounded to them by experts but are liable to be taken in by spurious ways of making money offered to them by swindlers masquerading as experts. It is that the expert relies on reason, which if elaborate, is beyond the grasp of the business man, while the swindler, though apparently relying on reason, in reality relies on sentiment. While pretending to use reason he contrives to stimulate

As a proof of the correctness of this view one may instance the only kind of trickery to which the expert is liable, so far as my information goes. Experts can make no claim to to be specially informed about the wiles of their fellow men. They are liable to be approached by confidence tricksters and I have known of this happening but I have never yet heard of their being taken in by them. If it is correct that they are generally immune to such trickery, this may be due to the fact that the desire for gain is not the expert's ruling passion. His ruling passion is the desire for knowledge. A swindler to whose wiles the expert is sometimes liable is the spiritualist who appeals to him by offering him knowledge of another world. His desire for knowledge of the world of spirits may vitiate the judgement of the expert and lead him to make a wrong estimate of the value of the evidence brought forward by the spiritualist. Owing to the insidious and dangerous effects of suggestion on the mind, a very special training is necessary to enable anyone to be a competent judge of what actually happens at a spiritualistic seance. The interpretation of the facts, so far as they depend on trickery, demands the help of an expert conjuror. Their interpretation, so far as they depend on abnormal states of the mind, as occurs when the medium is in a state of trance, requires the help of an expert in psychology. Such an expert, if he tackles spiritualistic phenomena, would do well to begin by reading "*A History of Modern Spiritualism*" by Podmore. It is almost pathetic to read in this book of instances of experts, eminent in subjects other than knowledge of the human mind, failing to estimate the value of the evidence put before them, owing to their ignorance of the sources of error involved.

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If a swindler goes to a business man and offers to make gold out of saw-dust, the business man, if he is well advised, sees that it is a question of chemistry and that, not being a chemist, he is no judge of the value of the evidence brought forward.

But because his desire for gain vitiates his judgement he does not think of this. He does not realise that he wants expert help in interpreting the evidence. He interprets it himself and is swindled.

The case is exactly similar with spiritualist mediums. Any one who goes to a spiritualistic seance would see that it was a case for interpretation by expert psychologists were it not for the fact that the desire for knowledge of the spirit world vitiates his judgement and leads him to make the interpretation himself. Hence it is that he allows himself to be humbugged by fraudulent mediums whose tricks have been exposed again and again. A man once described to me some absurd manifestation of spirits and took up the "Do you doubt my word?" standpoint. My answer was that I was far from doubting his word. "I think," said I, "that you have completely proved your point, but you have also proved that God Almighty is a mountebank,"—a reply which perhaps was as good as the subject deserved.

The practical moral to be drawn from the foregoing is that the business man would do well to get expert opinion before investing in any scheme depending on a supposed scientific discovery. Schemes for making aniline dyes from coal tar, or nitrates from the air, or gold from sawdust, or diamonds from soot, should all be regarded as potential confidence tricks by the business man. The swindler who makes gold from sawdust is likely to be as convincing to the business man as the scientist who make dyes from coal tar. It is only an expert who can say definitely that one scheme is good and the other bad.

An independent expert whose fee is fixed in advance is quite certain not to have his judgement vitiated by the desire for gain. He is above this bias which may influence the business man. Unfortunately he is liable to a bias of another kind.

discoveries. But perhaps from the point of view of the business man this is an error on the right side.

As experts are I think always aware of the danger of prejudice and are usually successful in avoiding it, this particular case of bias will repay investigation.

As an example of scientific opposition to new discoveries a contemporary criticism of Vesalius may be quoted. This man is now known as the father of modern anatomy. His great work "*De Humani Corporis Fabrica*" was published in 1543. The novelty of this work consisted in the fact that he relied on his own observations instead of on authority. His teachings were at first vigorously opposed. "Sylvius, his old teacher, was one of his bitterest opponents; he declared that the human body had undergone changes in structure since the time of Galen, and with the object of defending the ancient anatomist, "he asserted that the straight thigh bones, which, as every one saw, were not curved in accordance with the teachings of Galen, were the result of the narrow trousers of his contemporaries, and that they must have been curved in their natural condition, when uninterfered with by art."\*

Here we have hostility to what is new resulting in an attempt to support the old by the wildest of theorising. No doubt this is an extreme case but yet it may be doubted whether, at the present day, the frame of mind that produces the tight-trouser hypothesis is extinct.

Keith says that "our predecessors were largely influenced by prejudice," when referring to their hesitation in accepting the evidence of the antiquity of man.† In saying this he is referring to such men as Lyell and Huxley. Anyone asked to make a list of the most eminent scientific men of the last century would certainly include Lyell the geologist, and Huxley

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\* Locy "*Biology and Its Makers*," p. 35.



the biologist. It is highly improbable that either of these men had any conscious bias in favour of the Mosaic cosmogony, but yet when they came across discoveries that upset prevalent beliefs they were "largely influenced by prejudice." As an example of their scepticism the case of the human jaw bone found in the Moulin Quignon gravel pit in north-west France may be quoted. Huxley was on a committee that examined this specimen and that rejected its authenticity. They concluded that the jaw bone had been placed in the gravel pit by the workmen to deceive Boucher de Perthes, an experienced scientist, who had taken it out of the gravel with his own hands. This conclusion appears remarkable in view of the fact that the part of the bone to which the muscles of mastication were attached resembled that of a native Australian in certain striking features and differed in these features from the jaw bone of a Frenchman. It may well be asked where could the workmen have found such a jaw bone if it was really a case of attempted fraud?

An experienced expert, when talking to me about a certain important discovery he had made, said that he had discovered it some months before he was able to realize that it was a discovery at all. The facts were under his eyes; he had discovered them himself; and yet, something in his mind blinded him to the meaning and importance of what he had found out.

To say that this something was the influence of preconceived ideas may be a statement of fact, but it does not carry us very far towards an explanation. Sometimes it is possible that opposition to a new discovery is based simply on intolerance of the ingenious ideas of other people. But it is obvious that such an explanation will not easily apply to some of the instances I have quoted. Perhaps this opposition is analogous

disparage by far-fetched objections. For instance, when the first submarine cable was laid across the Channel the objection was seriously put forward that the Dover end would have to be defended by a fort. Otherwise if the French made war on England and landed at Dover the cable would be of use to them.\*

An opposition to a new discovery that leads experts to refuse to accept it, till it has been confirmed by an independent worker working in another laboratory, under different conditions, may not be logical, but it is practical and even advisable. But an opposition to a new discovery that leads experts not to criticise it but to ignore it, is neither logical nor practical. Such scepticism has in the past hindered the progress of science and may do so in the future. Experts who feel highly critical of some new discovery should bear in mind the possibility that they are as liable as the distinguished scientists above quoted to be "largely influenced by prejudice," when dealing with matters that conflict with pre-conceived ideas.

That sentiment may influence judgement is an old story. The instances quoted in this chapter are either not known or not recognised. In one class, the business man forsakes his common sense for reason and becomes the victim of a confidence trick; in the other class, the expert, who uses his reasoning power when dealing with his own discoveries, uses his commonsense when dealing with the discoveries of other people. The results are equally unsatisfactory. Whether this is due to his commonsense being of an inferior quality or to its being misapplied on such occasions may be left an open question.

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## CHAPTER X.

### ON THE MENTAL LIMITATIONS OF THE GLOBE-TROTTER.

Lack of Judgement shown especially by the more Intelligent Travellers—  
Examples—Change of Scene a Rest to the Brain—The Part that Rests  
not Connected with Incoming Sensations—Self-confidence of the  
Globe-Trotter—Abnormal Intensity of Sensory Impressions Affecting  
Judgement.

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IN this chapter I have no intention of throwing any aspersions on the experienced traveller. The familiar term "globe-trotter" will be used to designate travellers who probably are travelling for the first time and who appear to be affected by the strangeness of their surroundings.

During the twenty-seven years that I have lived in Agra many globe-trotters have arrived with letters of introduction to me. I have often entertained them and occasionally have been entertained by them in a different sense of the word.

Among such globe-trotters it is the more receptive and more intelligent who often suffer from a curious lack of judgement. The result of this is illustrated by the following incidents.

Many years ago a member of Parliament was in Agra at a time when a famine was going on a few hundred miles away at the other end of the United Provinces. By a very remarkable system of organisation, government was cheaply and efficiently giving daily relief to some six million people. This merely aroused the visitor's indignation. He wanted government to move the distressed population to the banks of the river Indus, then and at once, oblivious of all the difficulties that might accompany the transport of six million people and finding food for them till they had raised their crops in their new environment.

A particularly intelligent American, who had given me a very clear account of contemporary American politics, when on his way back from some sight-seeing, noticed a light on the

opposite bank of the river. "What is that?" said he, "That," I replied "is an electric light on the top of a flour mill belonging to Messrs. John and Co. It is thirty-two candle-power." "Indeed it is'nt," said he, "It is the light on the top of a Parsee fire temple." As a matter of fact there are no Parsee fire temples within 800 miles of Agra.

Not only do globe-trotters occasionally misinterpret what they see, but they are also liable to suffer from fixed ideas of a very obstinate kind. A globe-trotter who had just arrived in Bombay refused to eat bananas at breakfast because he had read in the paper that cholera had appeared in Peshawar. It was quite useless to demonstrate to him that Peshawar was more than a thousand miles away and that there was no cholera in Bombay. My argument was quite unacceptable because the Peshawar cholera might be travelling in his direction.

When plague broke out in Bombay in 1896, many distinguished scientists came from Europe to investigate the disease. For the time being they were globe-trotters and, apparently from this cause, their reports uniformly showed less scientific acumen than one might expect. One of these scientists shortly after his arrival was found to be suffering from a fixed idea that plague was due to lack of ventilation. He had himself seen that plague-infected houses were ill-ventilated, and was unduly impressed with the value of this observation. He was on a commission before which I gave evidence. "Dr. Hankin," he said, "I hear that you do not think that lack of ventilation is the sole cause of plague. Please give us a reason." My reply was to the effect that "When plague broke out in Hardwar, monkeys were affected in far greater proportion than human beings, though monkeys never go into unventilated places." After a whispered remark from another member of the commission, who I suspect had a well developed sense of humour, he asked me, "How do you know that monkeys would not have suffered still more severely if they *had* gone into insanitary

places?" My answer was, "Government, realising the danger, had these monkeys caught, put in cages, and liberated a hundred miles away in the jungle. While in the cages, which were very over-crowded and quite insanitary, not a single monkey suffered from plague." \* It afterwards appeared that neither this nor any other evidence could disturb his faith in his own theory.

Once I was talking to an Australian gentleman on a P. and O. steamer. He told me he was interested in emigrants and had had a good deal to do with helping them when they arrived in Australia. "For how long, after their arrival," said I, "do these emigrants show lack of common sense?" "How do you know that they do?" he asked, "Have you ever been in Australia?" I told him I had never been in Australia and had never seen an emigrant, but that I had studied the natural history of globe-trotters. He then told me that freshly arrived emigrants do as a fact often show a conspicuous lack of judgement, and that this lack of judgement generally lasts for about a year. My informant told me of an American gentleman who had had exactly the same experience with emigrants in New York.

The globe-trotter is enjoying the rest to the brain that is known to be caused by a change of scene. His brain, or rather part of it, as I am about to explain, is resting. But he is blissfully unconscious that when his brain is resting it is not wide awake. In his strange surroundings he is engaged in taking in sensory impressions that, at the time, occupy far more of his consciousness than do ordinary sense impressions that he experiences when at home. The globe-trotter shows no decreased power of taking in such impressions. The part of his brain that rests is not the part immediately connected with the sense organs. A distinguished scientist demurred when I told

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\* It was impossible for Government to kill these monkeys as they are regarded as sacred by the Hindus.

him that I thought a man was mentally handicapped when in strange surroundings. He told me he had once come to India for a few weeks to carry out a certain research. He found out so much in that time, he said, that, when he got home, it took him two years to write out an account of his discoveries. His receptive powers were not diminished and perhaps were increased while he was in India. But his power of forming an act of judgement on the facts discovered was only shown and, as I believe, only available when he had returned home and ceased to be a globe-trotter.

An unfortunate defect of the globe-trotter is that he is unduly confident, dogmatic, and cocksure. He feels that he is thinking well and clearly and his opinions seem to him to be sharpcut, logical, and above criticism. This sensation of clear thinking may be partly due to the globe-trotter's good bodily health. But probably it is to a greater extent due to his subconscious mind not being in a position to act as a mentor and to inculcate caution.

The reader may perhaps ask what connection is there between the mental deficiencies of the globe-trotter and the subject of this book? The answer is that they show, in a striking way, that common sense is not an unchangeable character of the mind but that it is a character that may be profoundly affected by external conditions. The conditions that depress it have been shown to be consistent with good bodily health and freedom from worry and overwork. If our subconscious mental powers are thus capable of being depressed by external influences, it is not an irrational enquiry whether other external influences may not be found by which they may be stimulated. This will be a subject of enquiry in the next chapter.

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## CHAPTER XI.

### THE EDUCATION OF THE EXPERT.

Necessity of Stimulating the Mechanism for Forgetting—Methods of Doing this—Mental Arithmetic—Arabic and Chinese Classics—Study of Inflected Languages—Value of Formal Discipline in Stimulating Powers of the Subconscious Mind—Bad Effects of Stimulating Reason and Interest at too Early an Age—Conclusion.

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ONE great problem of the future is how to inoculate our administrators and men of business with sufficient knowledge for them to understand the value of science. Scarcely less in importance is the problem how to educate our experts that they may be capable of playing that part in public affairs that is likely to be demanded of them in the future.

At first sight it would seem that the expert has little to grumble at in the existing system of education, at least so far as its method is concerned.

The expert needs a good memory and this is just what the schoolmaster tries to give him. The schoolmaster tries to make his pupils interested in their work, and interest in his work is a *sine qua non* for the expert. The expert requires reason and the schoolmaster does his best to develop this power of the mind.

The expert has little need of rapid initiative. He has to learn to avoid rapid decisions. He must subject everything he finds out to every possible test. He must accept nothing as proved until it has passed the test of reason. Here, again, the expert gets what he wants in education. Evidence has been brought forward in an earlier chapter proving that education tends to check initiative while stimulating the reasoning powers of the mind.

Thus, apparently, the method of modern education would not be very different from what it is, if its object were to turn

everyone into an expert. The expert is the schoolmaster's *chef-d'œuvre*.

Before accepting such a state of affairs as satisfactory it will be well to look into the matter a little further.

That the mechanism for forgetting is an essential part of our mental outfit is a fact generally recognised. The evidence that has been adduced in this book demonstrates that it plays an important part in the subconscious activities of our mind. Hence in education there are, or may be, two rival aims : one, the artificial development of memory that will aid reason ; the other the artificial development of the power of forgetting that will aid common sense, the business instinct and other powers of the subconscious mind. How these rival aims may be expected to work in practice, should it be possible to achieve them completely, will be understood from the following illustration.

Supposing a boy has had an education by which his memory has been stimulated and developed by constant appeals to his interest and his reason, then he will lack the power of quick forgetting. Because he is in the habit of reasoning about everything he learns he will have a habit of keeping his stored data within easy reach of consciousness. To revert to the comparison of the memory to a warehouse, he will have a habit of keeping his goods for a long time on the ground floor. They are only sent upstairs after long delay, and, as we have seen, it is only when this has happened that they are at the disposal of the subconscious mind.

Now, a boy with such mental habits, we may suppose, will be good at reasoning, so far as reasoning consists in recalling to mind all the different *pros* and *cons*. This mental habit will be invaluable to him in any scientific research. In studying the subject the more he remembers of the details the better will he be qualified to use them in reasoned arguments.

But suppose the boy grows up and has to interest himself in some affair of business, or politics or administration,

which from its nature is better treated by the subconscious mind than by conscious reason, let us see what happens. In accordance with his usual habit he will take in the details of the matter with effort and, as usual with him, he will remember them or a great part of them. They remain, in other words, in great part at least, present to his consciousness and he will inevitably attack the problem by means of reason.

On the other hand, let us take the case of a man who, owing to the method of his education (assuming for the moment that such a method is possible), has acquired the faculty of forgetting things he learns with effort. It goes without saying that in any scientific research he will be very much at sea. But supposing he has to tackle a problem of a kind that requires to be solved with the help of the subconscious mind, then, as he studies the subject, he takes in the details with effort, and, in accordance with his usual habit he forgets them. His consciousness merely retains a general idea of the matter. The forgotten details are stored in the subconscious mind and are ready to aid him in an act of subconscious judgement. He will be in the position of the jurymen who has forgotten the bulk of the evidence. He will give a common-sense verdict instead of a reasoned decision.

The next question that arises is whether any systems of education exist that may be regarded as methods of stimulating the power of forgetting, and if so, what effects they have on the abilities of the pupil in after life. From this point of view it will be of interest to examine (1) education in mental arithmetic used by Baniyas and Marwaris in India, (2) education consisting in learning by rote of Arabic and Chinese classics, (3) learning highly inflected languages.

(1) There is nothing in a multiplication table to appeal either to a boy's interest or to his reason. Nevertheless, that an education consisting of multiplication tables and little else

may aid the development of the business instinct appears to be shown by the following somewhat singular facts.

The Baniyas are a trading caste widely distributed throughout India. In the more old-fashioned village schools attended by boys of this caste, mental arithmetic is the only subject taught. I find it described in an official report as "a system of mental arithmetic that made the brain reel to contemplate" (1). The first part of this education consists of multiplication tables, some of which are very complicated and which are, in some schools, learnt without the help of books or writing material or even of symbols (2). The following table will serve as an example:—

“Four and a half times one and a half are six and three quarters.

Four and a half times two and a half are eleven and a quarter.

Four and a half times three and a half are fifteen and three quarters.

Four and a half times four and a half are twenty and a quarter.

Four and a half times five and a half are twenty-four and three quarters.

Four and a half times six and a half are twenty-nine and a quarter.

Four and a half times seven and a half are thirty-three and three quarters.

Four and a half times eight and a half are thirty-eight and a quarter.

Four and a half times nine and a half are forty-two and three quarters.

Four and a half times ten and a half are forty-seven and a quarter.

After a course of such tables the pupils finish their education by learning a number of rules for rapid mental calculations and formulæ for calculating prices.



The result of this education is to turn out men who are not only very adept in mental arithmetic but who also are very capable in money-lending and any kind of trade needing business instinct. The village Baniya is generally a grain-dealer. He usually keeps his accounts in his head. At the end of the day he can remember exactly how much he has sold of each of the half dozen kinds of grain that he deals in and the total takings. In towns, Banyias generally enter such transactions in account books. Their system of book-keeping is complicated. Arabic numerals are used for expressing rupees and special symbols for annas and pies.

The Baniyas used to be foremost in money-lending and banking in the bazaar in Calcutta. They remained pre-eminent so long as they adhered to their old system of education. But since they have taken to sending their sons to college, the result has been disastrous. They are now completely supplanted by the Marwaris, a caste who avoid western education as they would the plague. The Marwaris are even averse to sending their sons to school. They educate them at home and the chief part of their education is mental arithmetic of the kind above described. It is a remarkable fact that the financial ability of the Marwari community is such that the prices on the stock exchange in Calcutta are governed by Marwari opinion rather than by the opinion of the many English men of business to be found in Calcutta and who have all had the benefits of a rational education.

An embezzlement case was recently tried in Agra which was so complicated that the judge and the Indian barristers employed in it had no small difficulty in following the evidence. But some small boys of the Baniya caste, of ten or twelve years of age, were in court following the details of the case with evident interest. These Indian barristers no doubt had had a good education. The result of the introduction of western education into India has been to produce Indians who

are eminent in science, in the law, and in politics. As regards science I am convinced that the development of Indian science is only now beginning. But instinctive powers of the mind, such as the business instinct, are usually not so well developed among educated Indians as their general mental ability might lead one to anticipate.

In order to explain these facts it may be pointed out that the items of a multiplication table do not remain present to the consciousness in the same way as do a series of facts that appeal to reason. If a boy learns a number of facts about electricity, for example, he cannot understand one without remembering a good many of the others. They are interdependent. A fact of this nature is only learnt when it is understood. Understanding means that the mind brings the fact into relation with previously known facts which for the purpose have to be kept within easy reach of consciousness. To return to the warehouse simile, each fact learnt has to remain on the ground floor to be introduced to the new comers. It cannot be at once sent upstairs. It is not so with the multiplication table. Here a boy can learn a new item without calling to mind other items learnt previously. Thus the different items need not remain within such easy reach of consciousness as must occur with a number of facts relating to electricity. Multiplication tables therefore do not encumber the consciousness. They are a class of goods that is not kept on the ground floor but is at once sent upstairs to be called down to consciousness when needed. Hence the learning by rote of multiplication tables may be regarded as practice in forgetting. Anyone who has the discipline of learning such tables acquires a habit of rapidly sending his acquired impressions upstairs. This may be bad for reason, but I suggest may make a man the more capable of dealing with business affairs by the help of his subconscious mind.

(II) We will now consider the possible value of learning Arabic and Chinese classics by heart.

In the past, Indian Mahomedans have been obliged, on religious grounds, to learn the Koran in Arabic (which is not their mother tongue) before learning anything else. The Koran is learnt, or has been learnt, by rote, without any reference to grammar or syntax and often without any comprehension of its meaning.

Now Indian Mahomedans are pre-eminent for their business instinct. In Calcutta and Bombay, the whole of the wholesale trade in certain articles is in the hands of the Mahomedans. They are distinguished for their commercial ability, as shown in trade, rather than by financial ability as is possessed by the Marwaris. The education of these Mahomedan merchants has consisted of learning chapters of the Koran by heart, of learning enough Arabic characters to be able to read the Koran, enough arithmetic to keep their accounts, and practically nothing else.

It may be suggested that learning Arabic by rote has acted in exactly the same way as learning multiplication tables by rote, that it has given them a facility in treating matters by means of the subconscious mind, and therefore has made possible the development of their business instinct. (3).

At the present time the learning of Arabic is rapidly going out of fashion, despite the efforts of Government to encourage its study. It is said to be so necessary for boys who want to get on in business to know English, that Mahomedans are unwilling to incur the handicap of devoting two or three years of their school life to Arabic. The Mahomedan merchants of Bombay or Calcutta who got their education 20 or 30 years ago, all, no doubt, learnt Arabic. It will be interesting to see whether the next generation of Mahomedan merchants turns out to be as good as the present one at business. The comparison, when made, will give us data for judging whether the business instinct they now show is due to an inherited aptitude or to their inherited method of developing the

subconscious part of the mind by study of a classical language.

Among Asiatic races the Chinese are distinguished for their business instinct and also, as I learn from several sources, for another product of their subconscious minds, namely, their sense of humour. Their system of education resembles that of the Indian Baniyas in certain respects. In both systems, the main part of the education consists in learning by rote things imperfectly understood. In both systems the boys learn their lessons by repeating them aloud over and over again, hundreds of times, while rocking themselves to and fro. But the two systems of education differ entirely in their subject matter. The chief part of Chinese education consists in learning the names of, and learning to recognize, the written characters of classical Chinese, without any understanding of their meaning. The only relief the boy has from this tedious work is that, during part of the day, he is taught to copy the characters on paper. In his second year the boy has to return to the beginning of his primer—the "Three Character Classic"—and commences to learn the meaning of the words. Many finish their education at this stage. Others continue it by learning other books in the same way. The second book learnt is merely a list of four hundred and fifty characters employed as family names. All the other books used are ancient classics. After this education Chinese boys learn such arithmetic as is needed for business purposes. This they do easily and well with the help of the abacus. As a proof of their proficiency in arithmetic, it may be mentioned that Japanese banks generally have a Chinese accountant. The reason for this is stated to be, not so much the honesty of such an accountant, as the fact that, owing to the many varieties of dollar current in the Far East, it is only a Chinaman who can cope with the complicated mental arithmetic involved.

In Japanese education a system of written pictorial

characters has also to be learnt. But there is this important difference. The boy learns the meaning of the symbols at the same time as he learns to recognize them. Less time is spent in learning these characters than is the case with Chinese. The Japanese education is varied; many subjects are taught. It appeals throughout to the intelligence of the pupil.

One system produces men famed for their business instinct. The other system produces men of business distinguished not for business instinct but for their enterprise and their capacity for taking up new branches of trade.\* (4).

(III) The next point to consider is the possible educational value of learning highly inflected languages such as Latin or Greek.

Because Latin and Greek are highly inflected languages, the labour involved in learning them is out of all proportion to the knowledge gained. A boy who has to translate from a classical language has a great deal of difficulty with almost every word. He has to recognise whether it is a verb, an adjective, or a substantive. He has to decide whether it is singular or plural, masculine or feminine, or what is its tense or mood. But all this mental labour makes no permanent load on the memory. He may remember the meaning of the words; he may remember the grammar, but each individual application of his knowledge is at once forgotten as much as is the labour of turning over the pages of his dictionary. Thus in teaching a boy Latin or Greek he is made to do mental work that he at once forgets. His mechanism for forgetting is thereby stimulated. Though the impressions that thus reach the subconscious mind are, as a rule, of very trivial importance, the work is of value for it leads him to develop the habit of not

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\* Since the revolution in 1911, the Chinese Government has been rapidly modernising its system of education, so much so that it is anticipated that in a few years' time it will be difficult to find a Chinaman capable of reading his country's classics. Only the future can reveal the full effects of thus putting new wine into old bottles.

keeping in his consciousness a sharp-cut recollection of everything he learns with effort. He will have the habit of rapidly passing data on to the subconscious mind and therefore will have the power of dealing with them by means of his subconscious judgement.

In an earlier chapter a description of Lord Roberts was quoted to the effect that he had the special gift "that, out of the medley of unanswerable reasons, he had an instinct for selecting those which really mattered, and keeping his mind close shut against the rest." What this really means is that Lord Roberts had a well-developed power of forgetting. In dealing with an administrative matter he used instinct rather than reason because all the "unanswerable reasons" presented to him were at once passed on to his subconscious mind where they were dealt with by a process analogous to reason. The resulting decision of his subconscious mind returned to his consciousness together with some known reason for his decision that appeared to him overwhelming. It was only his conscious mind that was "close shut against the rest." Similarly a newspaper report of Mr. Lloyd George or some other statesman is likely to say that the individual in question has an instinctive power of seizing on the crucial point of any matter with which he has to deal. The implication that his mind works by recognising the important points and overlooking those that are unimportant is probably wrong. What happens is that all the different points are dealt with, not by his consciousness, but by his subconscious mind. The resultant of the reasoned decision of his subconscious mind alone comes back to consciousness. This mental habit would be fatal to a scientist who must needs have reasons for every stage of the mental processes by which he comes to a decision. With an affair of test-tubes he can only come to a decision when the data available are sufficient for the employment of reason. With an affair of state, when a rapid decision is required, it must often happen

that the available data are quite insufficient for treatment by reason. On such occasions the statesman must rely on his instinct if he wishes to come to an immediate decision. So doing would be impossible, if he had the mental habit of remembering everything he learns with effort.

It does not follow from the above explanation of the value of the classics that every erudite classical scholar must be a good business man. Cecil Rhodes once said that college dons are babes in financial matters. If investigation were to show that this is the case, and if it could be shown that the majority of college dons are erudite classical scholars, the above contention as to the value of elementary classics would not be invalidated. It is only so long as translating to and from these languages is an exertion that such work assists the development of the subconscious mind. If their study is prolonged until translation can be done with ease, the work becomes stimulating to reason and memory and the original stimulating effect on the subconscious mind may perhaps be obliterated.

In the above paragraphs various methods have been described by which we may hope to influence the development of the subconscious mind. No attempt has been made to make any definite suggestion as to what changes are called for in the present system of education. That is a matter for educational experts. Neither has any attempt been made to describe all the means whereby the development of the subconscious mind may be aided. Mathematics, drawing, painting and even mechanical work may probably be adapted to this end. It will be seen that these methods are comprised under what is known by educationalists as "formal discipline." Opponents of formal discipline in education assert that its effect is to depress the intelligence and to exhaust the boy's mental powers. It must be admitted that it is likely to have this effect in the hands of those who think that its value lies in its being dull and exhausting. But, if it is understood that its

main value consists in its being a means of stimulating the power of forgetting, then it is clear that fatigue and exhaustion can be and should be avoided. This may be best done by combining it with a sufficiency of freedom and relaxation. If the boy is not left free to himself after his day's work, if he is constantly under control, he gets practice in remembering rather than in forgetting. He is under what we may call "German discipline," a discipline that leaves him neither freedom of choice nor exercise for his initiative, a discipline that is likely to be harmful to the development of character and other capacities of the subconscious mind.\*

But an education consisting of formal discipline alone is not likely to suit the needs of the expert or, indeed, of anyone else. The problem is how to combine formal discipline with education in interesting and useful subjects.

In an earlier chapter instances have been quoted of business men who acquired scientific ability after developing business ability. From such instances we see that the possession of instinctive mental powers such as commercial aptitude is not incompatible with a high development of reason. But it is a matter of great interest that none of these instances were of men who began life as experts who had had a scientific education. It was only after there had been some opportunity for development of their subconscious minds in business or otherwise that they acquired ability as experts. Thus this evidence suggests that the education of the expert should begin by formal discipline and that only after a certain stage in his development should it be followed by work that tends to stimulate his reason and his memory.

Further evidence that education that depends on stimu-

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\* A Japanese gentleman has informed me that in Japan the custom of giving home work to children to be done in the evening was found to have undesirable consequences and has been dropped. The arguments brought forward in this paragraph suggest that this custom might be dropped elsewhere with advantage.



lation of reason and interest is not good for young boys is to be found in the effects of teaching science at an early age. Some years ago I was talking to a very distinguished scientist who, in the later years of his life, held a teaching post at a large college. In reply to my question whether he was letting his boy learn science, he said, "Indeed I am not. I find that students who come to me who have learnt science at school always do badly at it afterwards. They seem to be bored, *blasé* and indifferent." He told me that, for some reason which he did not understand, the mind of a young boy seemed to be harmed by scientific teaching. I repeated these remarks to a master at a large school. He was not surprised. He told me it was well-known at his school that if they wanted one of their boys to get an entrance exhibition or scholarship in science at the University, it was of little use to send up one who had had a regular scientific education. He would always be cut out by a boy who had taken classics and who had been crammed in science for three months before the examination. That boys who have learnt science at school do not do well in science afterwards is I believe, a view widely held. The explanation commonly given is that the better class of boys do not take science. It is very singular that boys should get classified in this way. There is at least room for the suspicion that the science boys are not of the better class because of the ill effects of their education.

The schoolmaster who judges of the progress of his pupils by what they do in the examination at the end of term is likely to rely on stimulating the interest of his pupils in their work, interest being the most potent aid to memory. The more the boy is interested the more is he likely to remember of his work and the better will he do in his examination. The disadvantages of this method are first, that it checks the development of the subconscious mind as above explained. Secondly, the boy learns to do with energy only those things that appeal to his interest. In real life he will often have to

do with energy things that cannot possibly appeal to his interest. One may expect that the stimulus of such interests as the schoolmaster is able to apply would at length wear off. Spices and pickles are a stimulus to digestion, but one would expect that if spices and pickles were mixed with all the food that a child has to eat, his palate would become jaded. That something of this kind happens to the child's mental palate as the result of the interest so freely administered nowadays in education is what one might expect. It is commonly said that education is made so interesting that when boys leave school and enter business they find it irksome and are apt to spend too much time in "watching the clock." A report published in 1918 by the London Education Committee contains the statement that the elementary schoolboy, after he has left school, is found to be deficient in handwriting, spelling, arithmetic, obedience, thoroughness, common sense and manners. The severer critics on this committee add that the boys are deficient in general accuracy, sense of honour or responsibility, respect to their elders and interest in their work. The public schoolboy is said to be unable to express himself in good English, and breaks down at tests of "grit, initiative and ability to grapple with new problems."

A little consideration will show that all the above defects are mainly, if not entirely, due to ill-development of the subconscious activities of the mind.

As a further proof that interesting studies are not good for boys I may cite the fact that in countries where exciting political agitations are going on, boys who are interested in such agitations are apt to lose their heads. For instance, to quote a somewhat extreme example, a graphic narrative in my possession relates how, as the result of the "passive resistance movement" against some unpopular legislation in India in April, 1919, "the spirit of disobedience spread to all classes of the population and the schoolboys did not escape the contagion." It

happened at the time that, at a certain school, an examination paper had been given that the boys considered was unduly hard. They demanded that it should be reset. On this demand being refused they retired from an interview with their headmaster with patriotic cries of "Bande mataram" and held a succession of meetings. They finally decided to murder the headmaster, an assistant master whom they suspected of having set the paper, and also two of their class fellows that they regarded as backsliders. The intended victims obtained news of what was afoot and took refuge in a house where they were besieged by the boys who had armed themselves with clubs. The siege went on during the night, but the would-be murderers were not accustomed to late hours and fell asleep by about two in the morning when the fugitives managed to escape.

As regards older students other grounds may be adduced why, as things are, their activity in politics is undesirable. Almost every problem that they meet with in their college life is of a kind that has to be solved with the help of reason. They have but little acquaintance with the problems of real life in which reason is generally of less importance than common sense and experience. It is not the mental ability of the student that is at fault, but the strangeness of the subject to him which makes him liable to be convinced by the first specious argument he hears. Though nothing can compensate completely for lack of experience, much good might be done if it were possible to give the student a better education in politics than is provided by platform speeches of itinerant politicians. In countries where democratic institutions are developing, it would be desirable to make "citizenship" a compulsory subject for the B.A. degree. Students would be little liable to show undue enthusiasm for a cause if that cause were materialised in an examination syllabus. What should be aimed at in teaching this subject is to give the student knowledge of actual facts. It should not be taught as a theoretical subject like political

economy, which, as it has come to my notice in India, appears to be a sort of political day-dreaming that, in so far as it resembles other day-dreaming, must be bad for the brain because it concentrates attention on attainment without reference to difficulties of attainment or to consequences of attainment.\*

Experienced schoolmasters say that tit-bits of interesting information are not good for boys. The boy should learn nothing except what he learns thoroughly. An English inspector of schools of my acquaintance even goes so far as to say that, in his experience, boys show less ability at schools where interesting magazines are taken in than they do at schools where no such attempt is made to stimulate their intelligence. It may be suggested that tit-bits of interesting information are bad for boys simply because they are interesting. They remain unduly present to the consciousness and interfere with the mechanism for forgetting.

À propos of this subject there is a curious piece of evidence which I owe to an officer who, during the war, was in charge of a training school for non-commissioned officers in England. "One fact," he writes, "I have established more or less clearly—the effect of close order drill on general obedience. I get six times as many charges (trivial) against N.C.O.'s, now that I try to develop their intelligence, as I did in the old days, when I taught nothing but drill with a view to influence character. Other conditions and type of man practically the same. My experience is based on over a thousand N.C.O.'s."

Thus one objection to teaching science at too early an age is that it arouses interest. The harm of interest is that it inhibits the mechanism for forgetting. Things in which one is interested remain for a long time within easy reach of consciousness. Another objection to teaching science at an early age is that it stimulates reason. This must be regarded

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\* See *Lunacy in India* by Major Overbeck-Wright, I.M.S. (Bailliere, Tindall and Cox, London, 1920).

as harmful on the same grounds. If one is in the habit of reasoning about everything one learns, one acquires a habit of keeping stored data within easy reach of consciousness. The mechanism for forgetting is again inhibited.

Why should there be any desire to stimulate reason at an early age except that it gives an appearance, now shown to be a delusive appearance, of progress? There is no great difficulty in plain reasoning. A child discovers how to do so for itself. Such pure reason as a child is capable of is but rarely used in practical life. The story of Babbage the mathematician, told in an earlier chapter, illustrates the absurd results that may follow the application of reason untempered by common sense. In practical affairs we require the help of our subconscious judgement in estimating the value of different data and in allowing for those that are missing. In a mathematical problem we may safely take all the data at their face value. Any one of them is in fact as important as any other and may, if neglected, throw us out in the result. But in the practical affairs of life we have to use, either reason or, more often, the subconscious mind in deciding that some data are more important than others. The difficulty does not lie with reason but in the subconscious mind whose help we chiefly rely on in estimating things at their real value. From this point of view the subconscious mind is more important than reason. It is the part of the mind we know least about and apparently the most difficult to develop. Evidence has been brought forward that the results of teaching boys things that are interesting, and appealing constantly to their reason, are the reverse of satisfactory. The premature stimulating of reason is giving strong meat to babes. It is nothing more than an attempt to upset the balance between the conscious and the subconscious parts of the mind. So far as practical affairs are concerned it is an attempt to teach boys to do with reason things that otherwise they would do, and do better, with the aid of their sub-conscious

judgement. Education of this nature acts as a forcing house for reason. It causes reason to develop, like a cuckoo in the nest, at the expense of those other qualities of the mind that are needed by the business man or the administrator.

One effect of this kind of education is that it produces people who pay too much respect to reason and too little respect to common sense and experience. The reason of such persons is apt to be interminable. They tempt us to define a reasoning creature as one who can do nothing else. Extreme instances of this tendency are offered, at the present day, by certain popular authors who write attractively on social and political matters, who contrive to make their reason masquerade as common sense, and who, if they have many readers, can boast of few converts. Macaulay says of a certain philosopher that "he had indeed acquired more learning than his slender faculties had been able to bear. The small intellectual spark which he possessed had been put out by the fuel." It appears from Macaulay's account that there was nothing wrong with the reason of this philosopher except that it was excessive and led him to conclusions that were revolting to common sense. We are dealing here with instances of undue reliance on reason that results from an insufficient development of those instinctive powers of the mind that are so important in the practical affairs of life.

It must be admitted that it would be somewhat undesirable for the expert to have the bent of mind of an ordinary administrator, but it is easy to adduce reasons why it would be advantageous for the education of the expert to influence his subconscious mind besides his reason. More than others, it may be urged, he requires an early development of the powers of the subconscious mind; there is little in his work to make it develop later, for in his researches he will be constantly exercising his reason in slow decisions rather than his subconscious mind in rapid decisions. In any line of reasoning the young

expert is apt to take the *pros* and *cons* at their face value. It would be an advantage to him if this were otherwise—if his subconscious mind was more fit than it is to act as a mentor and aid him in judging of the relative importance of the different data. It would be an advantage for it to be the rule, rather than the exception, as it now is, for the expert to have an instinctive power of deciding on the right method of experiment or the best line of research. For these reasons it seems desirable that the subconscious mind of the young expert should have a good start, even though it may not be necessary to develop it as far as is required for the business man.

In this connection it is of interest to compare the life histories of Herbert Spencer the philosopher and Professor Huxley the biologist.

Huxley's education included much stern discipline, both as a medical student and afterwards during his four years cruise on the "Rattlesnake." He alludes to the latter as a discipline that was "an education of inestimable value." Previously he had spent two years at "a pandemonium of a school" and after that he received "neither help nor sympathy in any intellectual direction" till he reached manhood. Huxley was an able administrator, a man of great common sense, and, in his researches, showed, from the beginning of his career, a remarkable power of choosing lines of research leading to important results.

Spencer's education, on the other hand, lacked discipline. It included much effort to develop his reason precociously. At a time when other children were hearing fairy stories, his father would be asking him "what is the cause of this?" or "how do you explain that?" He was a frequent listener at discussions on religion, politics and science. As he grew up he showed but little capacity for dealing with his fellow men. As a young man he spent much time and energy in matters that a modicum of common sense would have warned him

were highly unlikely to lead to useful results in his hands. Though not a chemist he tried to make crystals by electrolysis stimulated by "wild hopes of pecuniary success." Though not a physicist he tried to design a magneto-electric motor. He made a plan for a vast temple though he was not an architect. He studied plans for a universal language, a subject less appropriate for a philosopher than for a naturalised German jealous of the predominance of the English tongue. Though not a printer, he designed a printing press and also a machine for making type by compression for which he tried to raise capital. He lost £150 in patenting a machine for planing wood which led to no practical result. Perhaps his wildest scheme was for a flying machine consisting of a plane, on the top of which the passengers were to be seated, and which was to be propelled by a rope that connected it to an endless cable. This latter extended from the starting point to the destination. It was to be supported on sheaves and kept in motion, at high speed, by fixed engines. It was only at the age of 28 that Spencer dropped such attempts to apply his reason to practical affairs and discovered that his peculiar mental temperament fitted him for writing books on philosophy and for nothing else.

If the views here advocated are correct, what is required in education is to develop the boy's intelligence, not by prematurely stimulating his reason, but by stimulating his common sense by the methods above described. It is in this way that we should interpret the scriptural injunction to "train up a child in the way he should go." When the boy ceases to be a child he may safely follow the scriptural advice to "put away childish things" and begin to study subjects that stimulate his reason and interest and that are likely to be of use to him in after life. After he has developed the power of forgetting things learnt with effort, or in other words, after he has acquired the power of putting facts at the disposal of his subconscious mind, then the time will come when both his reason



and his memory may safely be stimulated by arousing his interest in his work. This is the stage when it will be safe and proper to teach him science and when, I venture to think, it should be taught not only to those who are destined to become experts but also to everyone else.

I should be unduly sanguine if I expected that my readers will find no faults of omission or commission in my descriptions of the subconscious mind and of memory. But it is highly unlikely that any faults that may be found will dispose of certain broad questions that have been raised; whether, for instance, the modern system of education does not, to some extent, ignore the subconscious mind; whether it is safe to assume that any mental power that we choose to call instinctive is necessarily incapable of being influenced or trained by education; and whether subconscious judgement is not of more importance in our mental processes than seems generally recognised. I can only hope that this book will be regarded as a contribution to the discussion of such problems.

#### NOTES

(1) The following is quoted from the "*General Report on Public Instruction in the United Provinces of Agra and Oudh for the year ending 31st March, 1912*," by C.F. de la Fosse, M.A., Director of Public Instruction, United Provinces:—

P. 97:—"Mahajani schools are widely scattered throughout the provinces and are to be found in most villages where traders congregate and in commercial towns. Their first purpose is to teach *paharas* and *Gurs*, i.e., multiplication and fractional tables and rules for rapid mental calculations. Some go no further, but the better ones add reading and writing in the mahajani character for the purpose of keeping *bahikhatas*, account books, in the native system of book-keeping, and for simple business letter-writing.

P. 98:—"Within earshot—for the indigenous school is a very noisy institution—of a board's primary school, huddled

in small *chaupal*, I found an aged teacher and about twenty very young scholars working at a system of mental arithmetic which made the brain reel to contemplate. By means of a very ingenious but wholly mechanical set of rules they were doing in their heads petty calculations of great intricacy. There were no books or *takhtis*, nor any school appliances whatever. Here was an institution of such hoary antiquity that it belonged to an age when writing was not in use and when necessity compelled men in default of it to invent devices for making complicated calculations in their heads. Like the marsupial or the duck-billed platypus it had managed to survive into a later period. It still had its uses though it has generated into a mere trade accomplishment; for the youthful baniya was set to learn therein and his parent was prepared to pay no less than four annas a month for him to do so."

(2) Some of these mahajani (money-lender) schools possess books. One of them which I obtained, began with multiplication tables which went as far as a multiplier of 40 and a multiplicand of 10. That is to say the last table of the series went from "40 times 1 is 40" up to "40 times 10 is 400." Then came a series of fractional tables in which the multiplier went up from 1 to 100. The multiplicand was  $1\frac{1}{4}$  in the first table  $1\frac{1}{2}$  in the second,  $2\frac{1}{2}$  in the third and so on up to  $4\frac{1}{2}$ . Thus the last of this series ended with "100 times  $4\frac{1}{2}$  is 450." Then came a table of squares going up to 100 times 100. This was followed by a series of higher tables in which the multipliers and multiplicands progressed by units from 11 to 20. Thus the last table of this series was "20 times 11 is 220" to "20 times 20 is 400." Then came a series of fractional tables. The first was "1 times  $\frac{1}{4}$  is  $\frac{1}{4}$ " up to "100 times  $\frac{1}{4}$  is 25." This was followed by "1 times  $\frac{1}{2}$ " and by "1 times  $\frac{3}{4}$ ." Then came multiplication tables in which both the multiplier and multiplicand were fractions. The first table began with " $1\frac{1}{2}$  times  $1\frac{1}{2}$  is  $2\frac{1}{4}$ " and went up to " $1\frac{1}{2}$  times  $10\frac{1}{2}$  is  $15\frac{3}{4}$ ." The multi-

pliers and multiplicands went up by units. That is, the next table began with " $2\frac{1}{2}$  times  $1\frac{1}{2}$  is  $3\frac{3}{4}$ " and the one following it with " $3\frac{1}{2}$  times  $1\frac{1}{2}$  is  $5\frac{1}{4}$ ." The last multiplier and the last multiplicand in each table was  $10\frac{1}{2}$ . Thus the last item of all was " $10\frac{1}{2}$  times  $10\frac{1}{2}$  is  $110\frac{1}{4}$ ."

All the multiplication tables are printed in columns containing ten items in each. At the foot of each column is written the total of the ten products that it includes. For instance, one column begins with " $61 \times \frac{3}{4} = 45\frac{3}{4}$ " and goes on as far as " $70 \times \frac{3}{4} = 52\frac{1}{2}$ ." The total of these two products together with the intermediate products is given as  $491\frac{1}{4}$ . I have been told that in some of these schools still more complicated multiplication tables are used. In "Life and Labour in India" by A. Yusuf Ali, p. 119, it is stated that the multiplication tables go up to 100 times 100.

(3) Certain occupations make more demand on intelligence, knowledge, and capacity for progress, than they do on the instinctive powers of the mind. One would expect that Mahomedans would be handicapped in following such occupations by their defective education. That this is the case is indicated by the following facts. With the help of the *Times of India Directory*, I compiled two lists of occupations containing about equal numbers of Bombay firms. One was of those demanding knowledge and enterprise. The other was of occupations that make more demand on the business instinct than on knowledge. The first list contains:—accountants, architects and surveyors, auctioneers, banks and bankers, billiard table manufacturers, booksellers and publishers, brokers, carbonic acid gas dealers, chemists and druggists, cinematograph importers, clearing and forwarding agents, coach builders, decorators, gramophone dealers, jewellers, gold and silver-smiths, machinery importers, opticians, photographers, photographic material dealers, provision merchants, and sewing machine dealers. The second list comprises:—bookbinders, boot and shoe makers,

carpet dealers, cotton and woollen merchants, glassware merchants, hardware dealers, horse importers, hosiery merchants, painters and colour dealers, paper merchants, perfumers, woollen goods dealers, saddlers and harness makers, stationers, sugar merchants, tailors, dressmakers and out-fitters, tanneries and hide merchants, and timber merchants. The first list includes, 1,154 firms of which 50 or 4 per cent have Mahomedan names. The second list comprises 1,152 firms of which 483 or 42 per cent have Mahomedan names. Thus the Mahomedans in Bombay figure more largely in occupations dealing with staple products than they do in occupations that frequently require new or special knowledge.

(4) It would be an interesting subject for research to enquire as to how far the intellectual activity of the subconscious mind is developed in different races of men. A business man of wide experience has informed me that the Indian Mahomedans and Chinese are pre-eminent among eastern races for their business instinct. The business instinct he informs me is lacking in Malays, Burmese, and Siamese, and it is not well developed in educated Hindus and Japanese. Another business man who was acquainted with all the above races except the Siamese gave me exactly the same estimate of their capacities. Savages, so far as I am aware, possess neither the business instinct nor any of the higher powers of subconscious judgement. But some of them at least can observe well and reason scientifically. For instance, it is stated of the Australian savages that "A little examination of the trunk of a tree, which may be nearly covered with the scratches of opossums ascending and descending, is sufficient to inform him whether one went up the night before without coming down again or not." (From an official report by Mr. Phillip Chauncey quoted in Mark Twain's *More Tramps Abroad*, p. 143.) Such reasoning based on minute observation has a close resemblance to the methods of Sherlock Holmes.

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